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(54) **GLUCOAMYLASE VARIANTS WITH ALTERED PROPERTIES**

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(58) **Field of Classification Search**

None

See application file for complete search history.

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(57) **ABSTRACT**

The present invention relates to variants of a parent glucoamylase having altered properties (e.g., improved thermostability and/or specific activity). In particular, the present invention provides compositions comprising the variant glucoamylases, including starch hydrolyzing compositions, animal feed compositions and cleaning compositions. The invention also relates to DNA constructs encoding the variants and methods of producing the glucoamylase variants in host cells.

5 Claims, 12 Drawing Sheets

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TrGA Parent Protein (632 Amino Acids) (SEQ ID NO: 1)

```
  1 MHVLSTAVLL GSVAVQKVLG RPGSSGLSDV TKRSVDDFIS TETPIALNNL
 51 LCNVGPDGCR AFGTSAGAVI ASPSTIDPDY YYMWTRDSAL VFKNLIDRFT
101 ETYDAGLQRR IEQYITAQVT LQGLSNPSGS LADGSGLGEP KFELTLKPFT
151 GNWGRPQRDG PALRAIALIG YSKWLINNNY QSTVSNVIWP IVRNDLNYVA
201 QYWNQTGFDL WEEVNGSSFF TVANQHRALV EGATLAATLG QSGSAYSSVA
251 PQVLCFLQRF WVSSGGYVDS NINTNEGRTG KDVNSVLTSI HTFDPNLGCD
301 AGTFQPCSDK ALSNLKVVVD SFRSIYGVNK GIPAGAAVAI GRYAEDVYYN
351 GNPWYLATFA AAEQLYDAIY VWKKTGSITV TATSLAFFQE LVPGVTAGTY
401 SSSSSTFTNI INAVSTYADG FLSEAAKYVP ADGSLAEQFD RNSGTPLSAL
451 HLTWSYASFL TATARRAGIV PPSWANSSAS TIPSTCSGAS VVGSYSRPTA
501 TSFPPSQTPK PGVPSGTPYT PLPCATPTSV AVTFHELVST QFGQTVKVAG
551 NAAALGNWST SAAVALDAVN YADNHPLWIG TVNLEAGDVV EYKYINVGQD
601 GSVTWESDPN HTYTVPAVAC VTQVVKEDTW QS
```

FIG. 1A

DNA Coding Sequence of TrGA (1899 bp) (SEQ ID NO: 4)

```
   1 ATGCACGTCC TGTCGACTGC GGTGCTGCTC GGCTCCGTTG CCGTTCAAAA
  51 GGTCCTGGGA AGACCAGGAT CAAGCGGTCT GTCCGACGTC ACCAAGAGGT
 101 CTGTTGACGA CTTCATCAGC ACCGAGACGC CTATTGCACT GAACAATCTT
 151 CTTTGCAATG TTGGTCCTGA TGGATGCCGT GCATTCGGCA CATCAGCTGG
 201 TGCGGTGATT GCATCTCCCA GCACAATTGA CCCGGACTAC TATTACATGT
 251 GGACGCGAGA TAGCGCTCTT GTCTTCAAGA ACCTCATCGA CCGCTTCACC
 301 GAAACGTACG ATGCGGGCCT GCAGCGCCGC ATCGAGCAGT ACATTACTGC
 351 CCAGGTCACT CTCCAGGGCC TCTCTAACCC CTCGGGCTCC CTCGCGGACG
 401 GCTCTGGTCT CGGCGAGCCC AAGTTTGAGT TGACCCTGAA GCCTTTCACC
 451 GGCAACTGGG GTCGACCGCA GCGGGATGGC CCAGCTCTGC GAGCCATTGC
 501 CTTGATTGGA TACTCAAAGT GGCTCATCAA CAACAACTAT CAGTCGACTG
 551 TGTCCAACGT CATCTGGCCT ATTGTGCGCA ACGACCTCAA CTATGTTGCC
 601 CAGTACTGGA ACCAAACCGG CTTTGACCTC TGGGAAGAAG TCAATGGGAG
 651 CTCATTCTTT ACTGTTGCCA ACCAGCACCG AGCACTTGTC GAGGGCGCCA
 701 CTCTTGCTGC CACTCTTGGC CAGTCGGGAA GCGCTTATTC ATCTGTTGCT
 751 CCCCAGGTTT TGTGCTTTCT CCAACGATTC TGGGTGTCGT CTGGTGGATA
 801 CGTCGACTCC AACATCAACA CCAACGAGGG CAGGACTGGC AAGGATGTCA
 851 ACTCCGTCCT GACTTCCATC CACACCTTCG ATCCCAACCT TGGCTGTGAC
 901 GCAGGCACCT TCCAGCCATG CAGTGACAAA GCGCTCTCCA ACCTCAAGGT
 951 TGTTGTCGAC TCCTTCCGCT CCATCTACGG CGTGAACAAG GGCATTCCTG
1001 CCGGTGCTGC CGTCGCCATT GGCCGGTATG CAGAGGATGT GTACTACAAC
1051 GGCAACCCTT GGTATCTTGC TACATTTGCT GCTGCCGAGC AGCTGTACGA
1101 TGCCATCTAC GTCTGGAAGA AGACGGGCTC CATCACGGTG ACCGCCACCT
1151 CCCTGGCCTT CTTCCAGGAG CTTGTTCCTG GCGTGACGGC CGGGACCTAC
1201 TCCAGCAGCT CTTCGACCTT TACCAACATC ATCAACGCCG TCTCGACATA
1251 CGCCGATGGC TTCCTCAGCG AGGCTGCCAA GTACGTCCCC GCCGACGGTT
1301 CGCTGGCCGA GCAGTTTGAC CGCAACAGCG GCACTCCGCT GTCTGCGCTT
1351 CACCTGACGT GGTCGTACGC CTCGTTCTTG ACAGCCACGG CCCGTCGGGC
1401 TGGCATCGTG CCCCCCTCGT GGGCCAACAG CAGCGCTAGC ACGATCCCCT
1451 CGACGTGCTC CGGCGCGTCC GTGGTCGGAT CCTACTCGCG TCCCACCGCC
1501 ACGTCATTCC CTCCGTCGCA GACGCCCAAG CCTGGCGTGC CTTCCGGTAC
1551 TCCCTACACG CCCCTGCCCT GCGCGACCCC AACCTCCGTG GCCGTCACCT
1601 TCCACGAGCT CGTGTCGACA CAGTTTGGCC AGACGGTCAA GGTGGCGGGC
1651 AACGCCGCGG CCCTGGGCAA CTGGAGCACG AGCGCCGCCG TGGCTCTGGA
1701 CGCCGTCAAC TATGCCGATA ACCACCCCCT GTGGATTGGG ACGGTCAACC
1751 TCGAGGCTGG AGACGTCGTG GAGTACAAGT ACATCAATGT GGGCCAAGAT
1801 GGCTCCGTGA CCTGGGAGAG TGATCCCAAC CACACTTACA CGGTTCCTGC
1851 GGTGGCTTGT GTGACGCAGG TTGTCAAGGA GGACACCTGG CAGTCGTAA
```

FIG. 1B

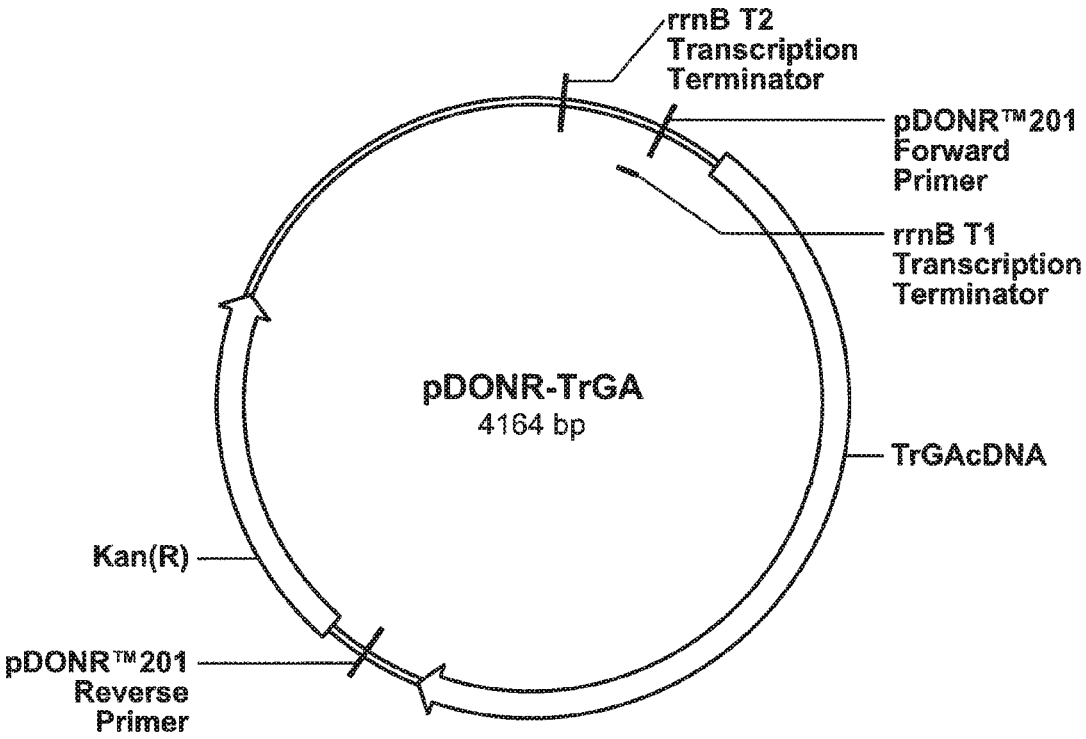
rrnB T2
Transcription
Terminator
pDONR™201
Forward
Primer
rrnB T1
Transcription
Terminator
pDONR-TrGA
4164 bp
TrGAcDNA
Kan(R)
pDONR™201
Reverse
Primer

FIG. 2

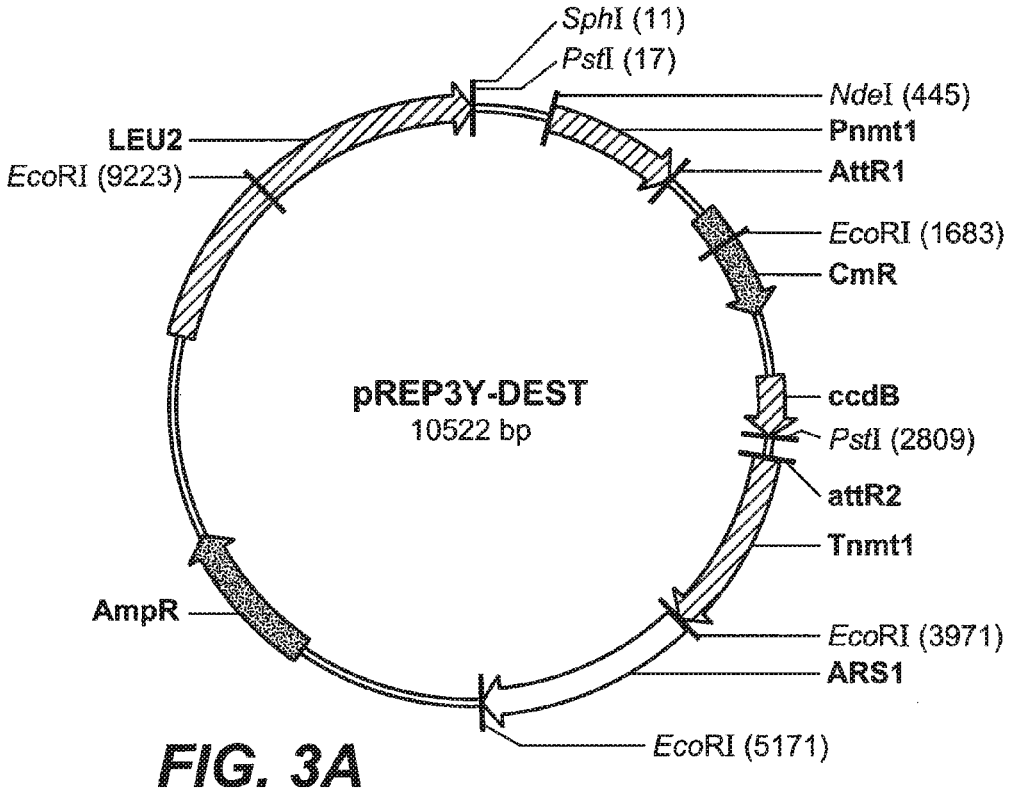
SphI (11)
PstI (17)
NdeI (445)
Pnmt1
AttR1
EcoRI (1683)
CmR
ccdB
PstI (2809)
attR2
Tnmt1
EcoRI (3971)
ARS1
EcoRI (5171)
AmpR
LEU2
EcoRI (9223)
pREP3Y-DEST
10522 bp

FIG. 3A

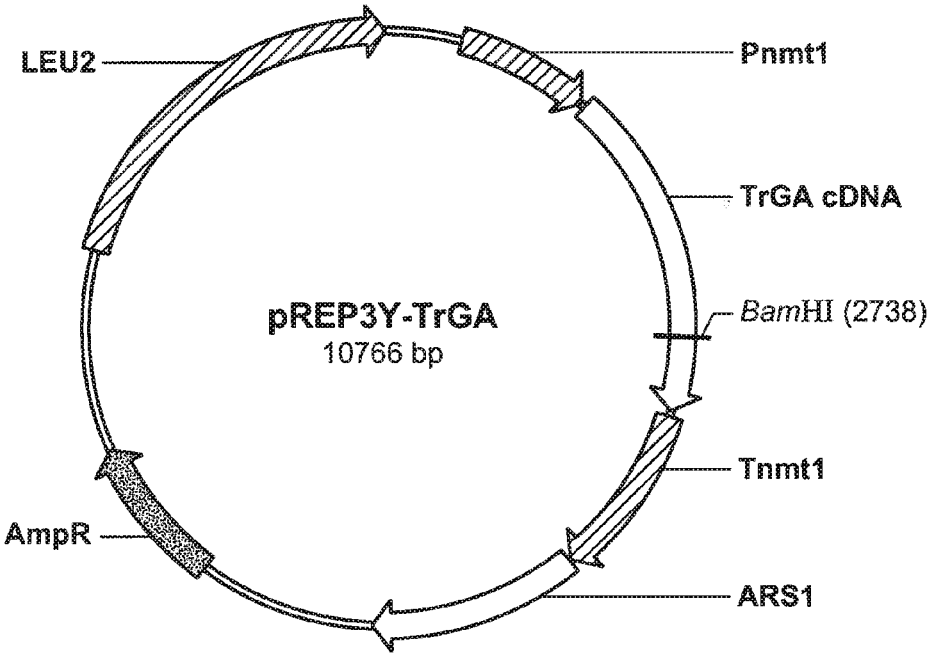
LEU2
Pnmt1
TrGA cDNA
BamHI (2738)
Tnmt1
ARS1
AmpR
pREP3Y-TrGA
10766 bp

FIG. 3B

```
AaGA      (1) -ATLDSWLSNEATVARTAILNNIGADGAWVSGADSGIVVASPSTDNPDYF
AnGA      (1) -ATLDSWLSNEATVARTAILNNIGADGAWVSGADSGIVVASPSTDNPDYF
AoGA      (1) QSDLNAFIEAQTPIAKQGYLNNIGADGKLVEGAAAGIVYASPSKSNPDYF
HgGA      (1) -AAVDTFINTEKPIAWNKLLANIGPNGKAAPGAAAGVVIASPSRTDPPYF
HvGA      (1) --SVDDFINTQTPIALNNLLCNVGPDGCRAFGTSAGAVIASPSTTDPDYY
TrGA      (1) --SVDDFISTETPIALNNLLCNVGPDGCRAFGTSAGAVIASPSTIDPDYY
                           *    * * *  *    *   * * ****   * *

AaGA     (50) YTWTRDSGLVIKTLVDLFRNGDTD-LLSTIENYISSQAIVQGISNPSGDL
AnGA     (50) YTWTRDSGLVLKTLVDLFRNGDTS-LLSTIENYISAQAIVQGISNPSGDL
AoGA     (51) YTWTRDAGLTMEEYIEQFIGGDAT-LESTIQNYVDSQANEQAVSNPSGGL
HgGA     (50) FTWTPDAALVLTGIIESLGHNYNT--------------TLQQVSNPSGTF
HvGA     (49) YMWTRDSALVFKNIVDRFTQQYDAGLQRRIEQYISAQVTLQGISNPSGSL
TrGA     (49) YMWTRDSALVFKNLIDRFTETYDAGLQRRIEQYITAQVTLQGLSNPSGSL
                ** *  *                                  *  *****

AaGA     (99) SSGG-LGEPKFNVDETAYTGSWGRPQRDGPALRATAMIGFRQWLLDNGYT
AnGA     (99) SSGAGLGEPKFNVDETAYTGSWGRPQRDGPALRATAMIGFGQWLLDNGYT
AoGA    (100) SDGSGLAEPKFYYNISQFTDSWGRPQRDGPALRASALIAYGNSLISSDKQ
HgGA     (86) ADGSGLGEAKFNVDLTAFTGEWGRPQRDGPPLRAIALIQYAKWLIANGYK
HvGA     (99) SDGSGLGEPKFELTLSQFTGNWGRPQRDGPALRAIALIGYSKWLINNNYQ
TrGA     (99) ADGSGLGEPKFELTLKPFTGNWGRPQRDGPALRAIALIGYSKWLINNNYQ
                *  * * **       *  ********* *** * *     *

AaGA    (148) SAATEIVWPLVRNDLSYVAQYWNQTGYDLWEEVNGSSFFTIAVQHRALVE
AnGA    (149) STATDIVWPLVRNDLSYVAQYWNQTGYDLWEEVNGSSFFTIAVQHRALVE
AoGA    (150) SVVKANIWPIYQNDLSYVGQYWNQTGFDLWEEVQGSSFFTVAVQHKALVE
HgGA    (136) STAKSVVWPVVKNDLAYTAQYWNETGFDLWEEVPGSSFFTIASSHRALTE
HvGA    (149) STVSNIIWPIVRNDLNYVAQYWNQTGFDLWEEVNGSSFFTVANQHRALVE
TrGA    (149) STVSNVIWPIVRNDLNYVAQYWNQTGFDLWEEVNGSSFFTVANQHRALVE
               *      **   *** *  **** ** ****** ****** *  * ** *

AaGA    (198) GSAFATAVGSSCSWCDSQAPQILCYLQSFWTG--EYILANFDSS--RSGK
AnGA    (199) GSAFATAVGSSCSWCDSQAPEILCYLQSFWTG--SFILANFDSS--RSGK
AoGA    (200) GDAFAKALGEECQACS-VAPQILCHLQDFWNG--SAVLSNLPTNG-RSGL
HgGA    (186) GAYLAAQLDTECPPCTTVAPQVLCFQQAFWNSKGNYVVSTSTAGEYRSGK
HvGA    (199) GATLAATLGQSGSTYSSVAPQILCFLQRFWVS-GGYIDSNINTNEGRTGK
TrGA    (199) GATLAATLGQSGSAYSSVAPQVLCFLQRFWVSSGGYVDSNINTNEGRTGK
               *   *             **  **  * **                * *

AaGA    (244) DTNTLLGSIHTFDPEAGCDDSTFQPCSPRALANHKEVVDSFRSIYTLNDG
AnGA    (245) DANTLLGSIHTFDPEAACDDSTFQPCSPRALANHKEVVDSFRSIYTLNDG
AoGA    (246) DTNSLLGSIHTFDPAAACDDTTFQPCSSRALSNHKLVVDSFRSVYGINNG
HgGA    (236) DANSILASIHNFDPEAGCDNLTFQPCSERALANHKAYVDSFRNLYAINKG
HvGA    (248) DANSLLASIHTFDPSLGCDASTFQPCSDKALSNLKVVVDSFRSIYGVNKG
TrGA    (249) DVNSVLTSIHTFDPNLGCDAGTFQPCSDKALSNLKVVVDSFRSIYGVNKG
               * *  * *** ***   **  ******  ** * *  *****  *  * *
```

FIG. 4A

```
AaGA   (294) LSDSEAVAVGRYPKDSYYNGNPWFLCTLAAAEQLYDALYQWDKQGSLEIT
AnGA   (295) LSDSEAVAVGRYPEDTYYNGNPWFLCTLAAAEQLYDALYQWDKQGSLEVT
AoGA   (296) RGAGKAAAVGPYAEDTYQGGNPWYLTTLVAAELLYDALYQWDKQGQVNVT
HgGA   (286) IAQGKAVAVGRYSEDVYYNGNPWYLANFAAAEQLYDAIYVWNKQGSITVT
HvGA   (298) IPAGSAVAIGRYPEDVYFNGNPWYLATFAAAEQLYDSVYVWKKTGSITVT
TrGA   (299) IPAGAAVAIGRYAEDVYYNGNPWYLATFAAAEQLYDAIYVWKKTGSITVT
                  * * * *  * *  **** *    *** ***  * * * *    *

AaGA   (344) DVSLDFFQALYSDAATGTYSSSSSTYSSIVDAVKTFADGFVSIVETHAAS
AnGA   (345) DVSLDFFKALYSDAATGTYSSSSSTYSSIVDAVKTFADGFVSIVETHAAS
AoGA   (346) ETSLPFFKDLSSNVTTGSYAKSSSAYESLTSAVKTYADGFISVVQEYTPD
HgGA   (336) SVSLPFFRDLVSSVSTGTYSKSSSTFTNIVNAVKAYADGFIEVAAKYTPS
HvGA   (348) STSSAFFQELVPGVAAGTYSSSQSTFTSIINAISTYADGFLSEAAKYVPA
TrGA   (349) ATSLAFFQELVPGVTAGTYSSSSSTFTNIINAVSTYADGFLSEAAKYVPA
              *  **  *      * *  * *       *    ****

AaGA   (394) NGSLSEQYDKSDGDELSARDLTWSYAALLTANNRRNSVMPPSWGETSAS-
AnGA   (395) NGSMSEQYDKSDGEQLSARDLTWSYAALLTANNRRNSVVPASWGETSAS-
AoGA   (396) GGALAEQYSRDQGTPVSASDLTWSYAAFLSAVGRRNGTVPASWGSSTAN-
HgGA   (386) NGALAEQYDRNTGKPDSAADLTWSYSAFLSAIDRRAGLVPPSWRASVAKS
HvGA   (398) DGSLAEQFDRNTGTPLSAVHLTWSYASFLTAAARRAGVVPPSWASSGAN-
TrGA   (399) DGSLAEQFDRNSGTPLSALHLTWSYASFLTATARRAGIVPPSWANSSAS-
              *   **     *   **  *****   * *  **    * **    *

AaGA   (443) SVPGTC
AnGA   (444) SVPGTC
AoGA   (445) AVPSQC
HgGA   (436) QLPSTC
HvGA   (447) TVPSSC
TrGA   (448) TIPSTC
              *  *
```

FIG. 4B

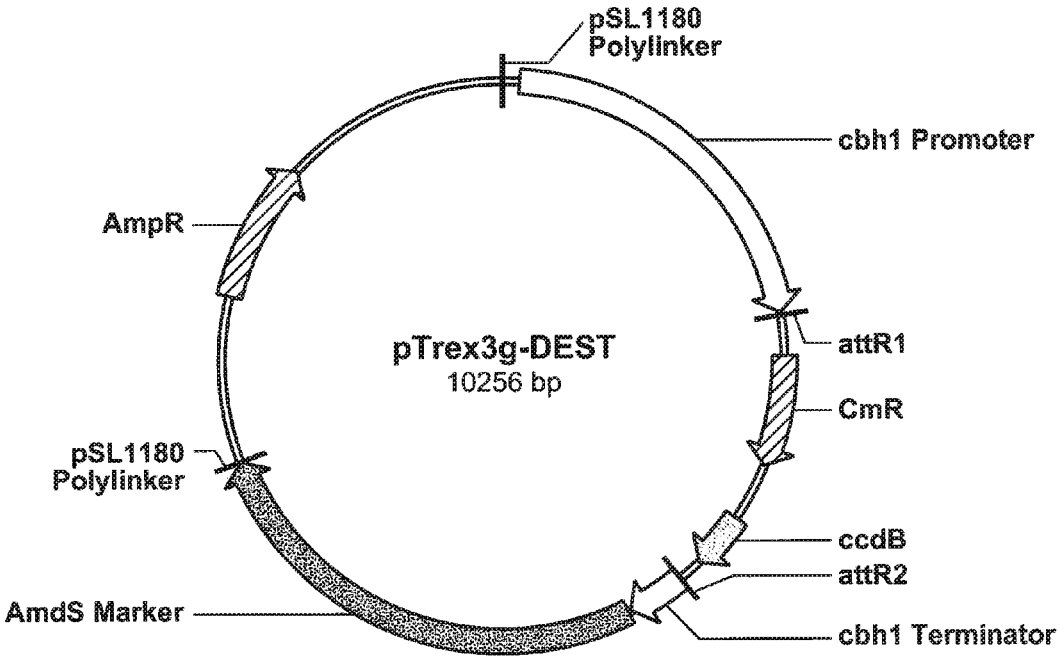
pSL1180
Polylinker
cbh1 Promoter
AmpR
attR1
pTrex3g-DEST
10256 bp
CmR
pSL1180
Polylinker
ccdB
attR2
AmdS Marker
cbh1 Terminator

FIG. 5A

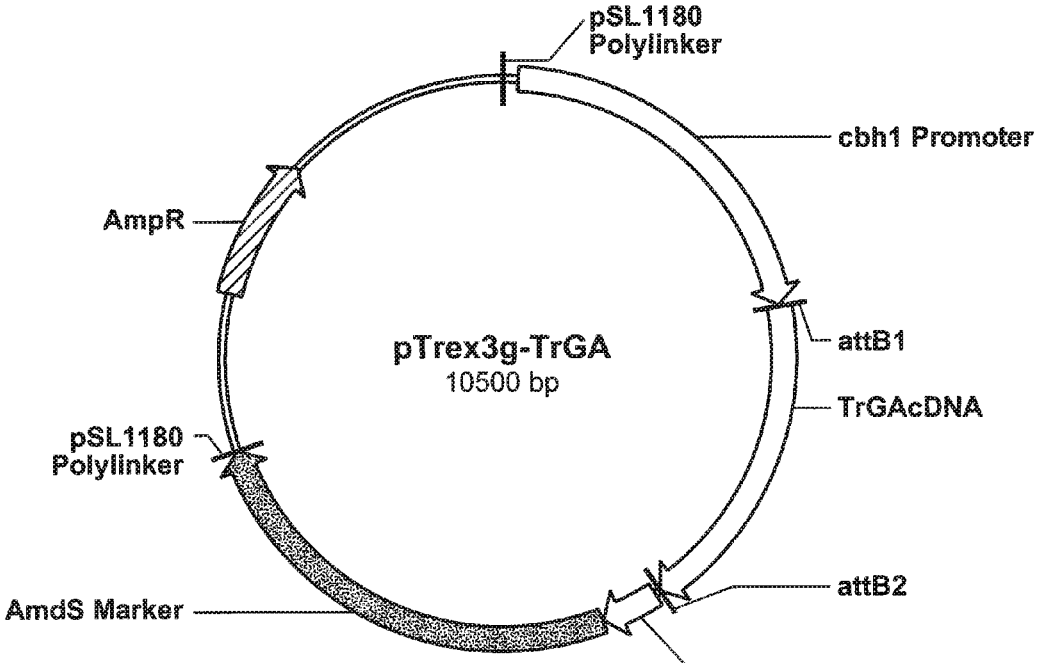
pSL1180
Polylinker
cbh1 Promoter
AmpR
attB1
pTrex3g-TrGA
10500 bp
TrGAcDNA
pSL1180
Polylinker
attB2
AmdS Marker
cbh1 Terminator

FIG. 5B

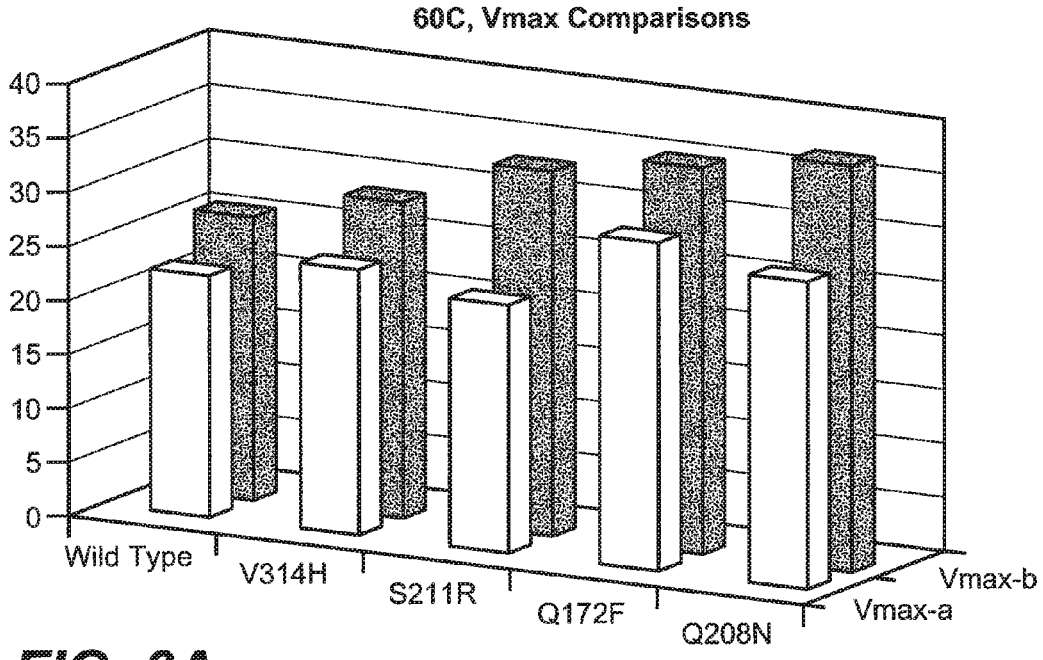
60C, Vmax Comparisons
40
35
30
25
20
15
10
5
0
Wild Type
V314H
S211R
Q172F
Q208N
Vmax-b
Vmax-a

FIG. 6A

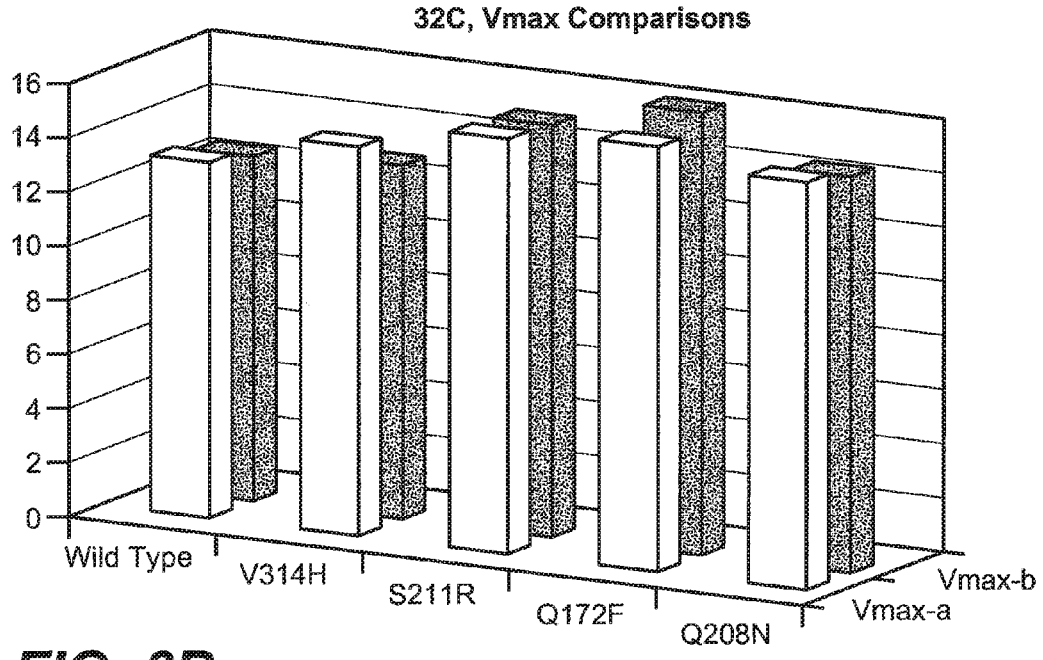
32C, Vmax Comparisons
16
14
12
10
8
6
4
2
0
Wild Type
V314H
S211R
Q172F
Q208N
Vmax-b
Vmax-a

FIG. 6B

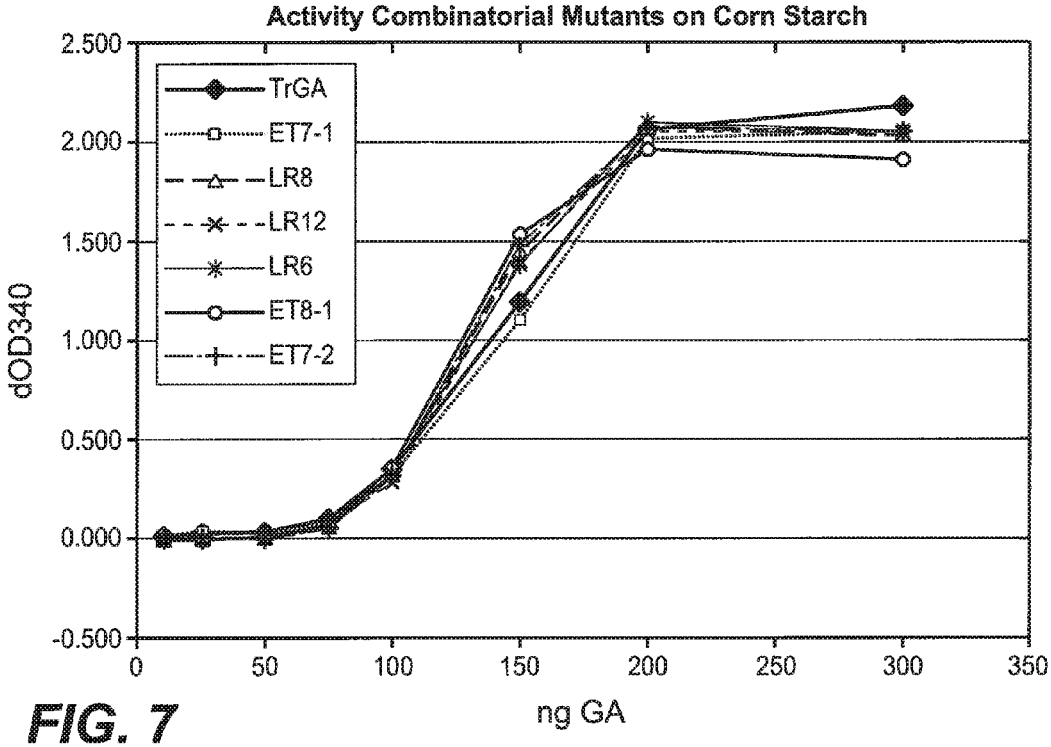
Activity Combinatorial Mutants on Corn Starch
dOD340
ng GA
TrGA
ET7-1
LR8
LR12
LR6
ET8-1
ET7-2
2.500
2.000
1.500
1.000
0.500
0.000
-0.500
0
50
100
150
200
250
300
350

FIG. 7

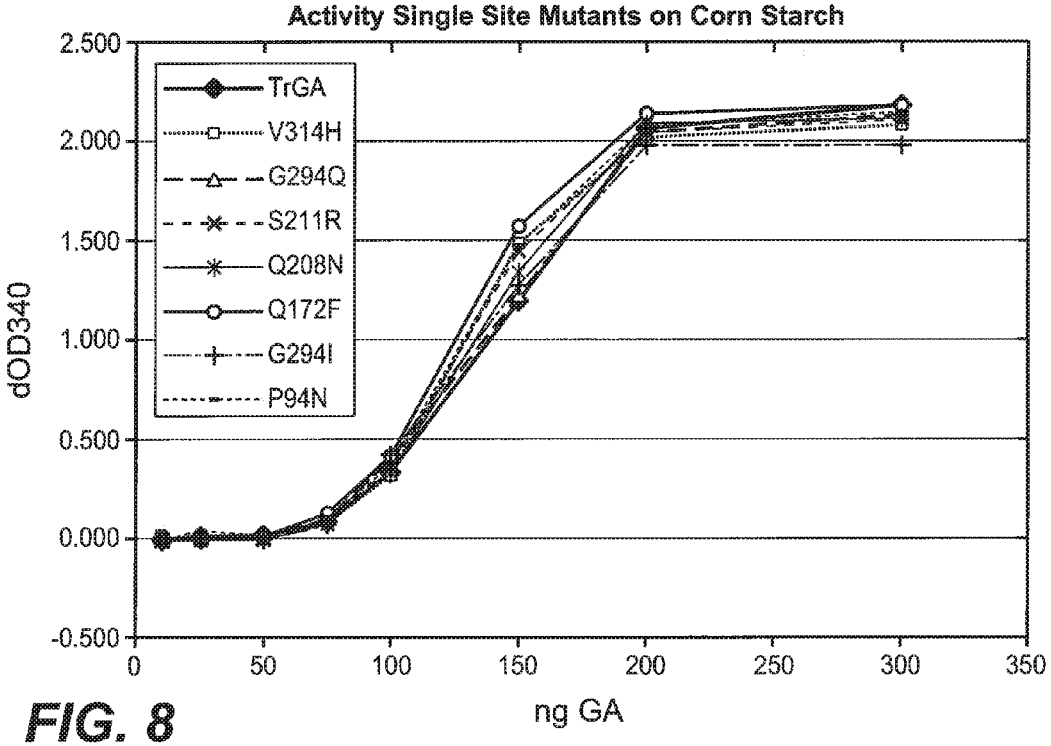
Activity Single Site Mutants on Corn Starch
dOD340
ng GA
TrGA
V314H
G294Q
S211R
Q208N
Q172F
G294I
P94N
2.500
2.000
1.500
1.000
0.500
0.000
-0.500
0
50
100
150
200
250
300
350

FIG. 8

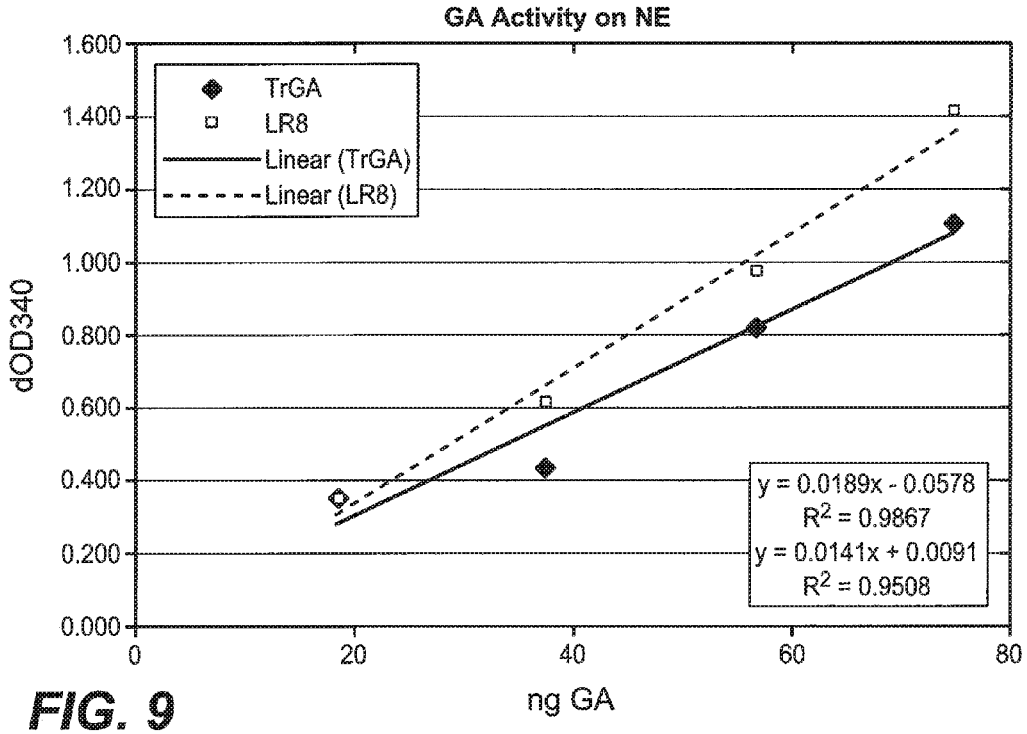
GA Activity on NE
TrGA
LR8
Linear (TrGA)
Linear (LR8)
y = 0.0189x - 0.0578
R2 = 0.9867
y = 0.0141x + 0.0091
R2 = 0.9508
dOD340
ng GA
0.000
0.200
0.400
0.600
0.800
1.000
1.200
1.400
1.600
0
20
40
60
80

FIG. 9

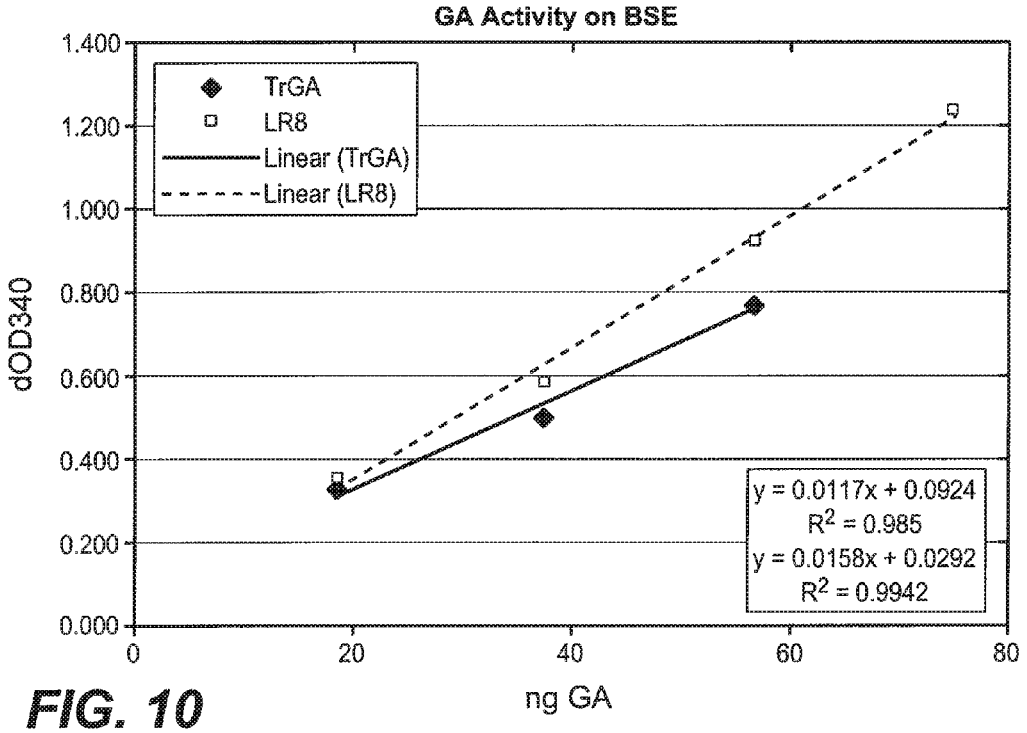
GA Activity on BSE
TrGA
LR8
Linear (TrGA)
Linear (LR8)
y = 0.0117x + 0.0924
R2 = 0.985
y = 0.0158x + 0.0292
R2 = 0.9942
dOD340
ng GA
0.000
0.200
0.400
0.600
0.800
1.000
1.200
1.400
0
20
40
60
80

FIG. 10

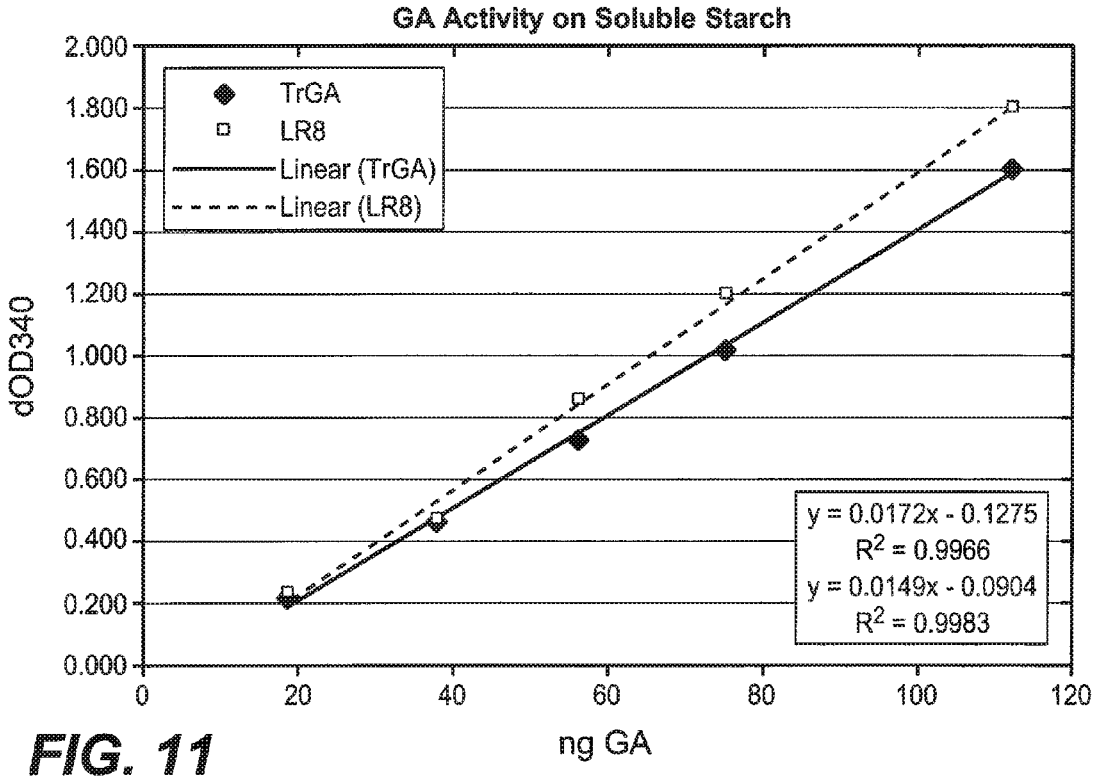
GA Activity on Soluble Starch
2.000
1.800
1.600
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
dOD340
0
20
40
60
80
100
120
ng GA
TrGA
LR8
Linear (TrGA)
Linear (LR8)
y = 0.0172x - 0.1275
R2 = 0.9966
y = 0.0149x - 0.0904
R2 = 0.9983

FIG. 11

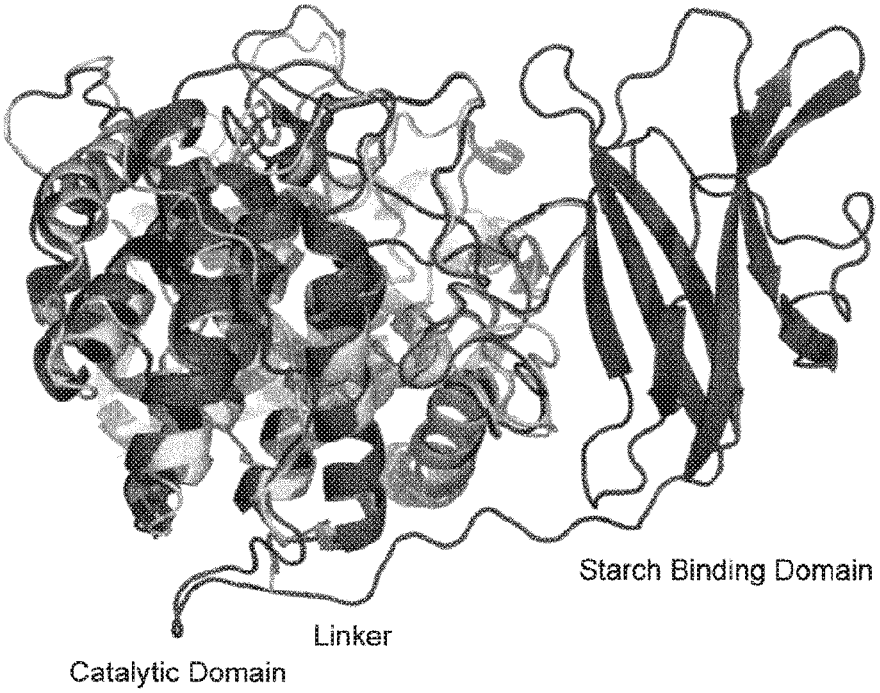
Starch Binding Domain
Linker
Catalytic Domain

FIG. 12

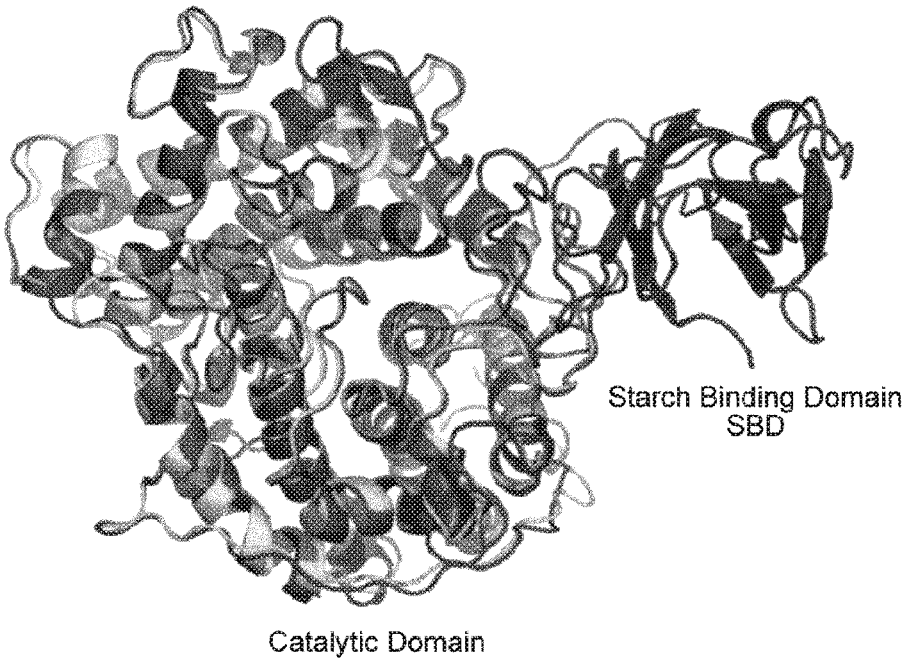
Starch Binding Domain
SBD
Catalytic Domain

FIG. 13

GLUCOAMYLASE VARIANTS WITH ALTERED PROPERTIES

CROSS REFERENCE TO RELATED APPLICATIONS

The present application is a divisional application of U.S. patent application Ser. No. 12/443,255, filed May 25, 2010, now U.S. Pat. No. 9,447,397, which claims priority under 35 U.S.C. § 371 to International Application No. PCT/US2007/021683, filed Oct. 9, 2007, which claims the benefit of U.S. Provisional Application Ser. No. 60/850,431, filed on Oct. 10, 2006, which are hereby incorporated by reference.

FIELD OF THE INVENTION

The present invention relates to variants of a parent glucoamylase having altered properties (e.g., improved thermostability and/or specific activity). In particular, the present invention provides compositions comprising the variant glucoamylases, including starch hydrolyzing compositions, animal feed compositions and cleaning compositions. The invention also relates to DNA constructs encoding the variants and methods of producing the glucoamylase variants in host cells.

BACKGROUND OF THE INVENTION

Glucoamylase enzymes (glucan 1,4-α-glucohydrolases, EC 3.2.1.3) are starch hydrolyzing exo-acting carbohydrases, which catalyze the removal of successive glucose units from the non-reducing ends of starch or related oligo and polysaccharide molecules. Glucoamylases can hydrolyze both the linear and branched glucosidic linkages of starch (e.g., amylose and amylopectin).

Glucoamylases are produced by numerous strains of bacteria, fungi, yeast and plants. Particularly interesting, and commercially important, glucoamylases are fungal enzymes that are extracellularly produced, for example from strains of *Aspergillus* (Svensson et al. (1983) *Carlsberg Res. Commun.* 48:529-544; Boel et al., (1984) *EMBO J.* 3:1097-1102; Hayashida et al., (1989) *Agric. Biol. Chem.* 53:923-929; U.S. Pat. No. 5,024,941; U.S. Pat. No. 4,794,175 and WO 88/09795); *Talaromyces* (U.S. Pat. No. 4,247,637; U.S. Pat. No. 6,255,084 and U.S. Pat. No. 6,620,924); *Rhizopus* (Ashikari et al., (1986) *Agric. Biol. Chem.* 50:957-964; Ashikari et al., (1989) *App. Microbiol. and Biotech.* 32:129-133 and U.S. Pat. No. 4,863,864); *Humicola* (WO 05/052148 and U.S. Pat. No. 4,618,579) and *Mucor* (Houghton-Larsen et al., (2003) *Appl. Microbiol. Biotechnol.* 62:210-217). Many of the genes that code for these enzymes have been cloned and expressed in yeast, fungal and/or bacterial cells.

Commercially, glucoamylases are very important enzymes and have been used in a wide variety of applications that require the hydrolysis of starch (e.g. for producing glucose and other monosaccharides from starch). Glucoamylases are used to produce high fructose corn sweeteners, which comprise over 50% of the sweetener market in the United States. In general, glucoamylases may be, and commonly are, used with alpha amylases in starch hydrolyzing processes to hydrolyze starch to dextrins and then glucose. The glucose may then be converted to fructose by other enzymes (e.g. glucose isomerases); crystallized; or used in fermentations to produce numerous end products (e.g., ethanol, citric acid, lactic acid, succinate, ascorbic acid intermediates, glutamic acid, glycerol and 1, 3 propanediol).

Ethanol produced by using glucoamylases in the fermentation of starch and/or cellulose containing material may be used as a source of fuel or for alcoholic consumption.

Although glucoamylases have been used successfully in commercial applications for many years, a need still exists for new glucoamylases with altered properties, such as improved specific activity and increased thermostability.

While different mutations have been made in glucoamylases of *Aspergillus*, which enhance thermal stability and specific activity and reference is made to U.S. Pat. No. 6,537,792; U.S. Pat. No. 6,352,851; Chen et al. (1996) *Prot. Eng.* 9:499-505, Chen et al., (1995) *Prot Eng.* 8:575-582; Fierobe et al. (1996) *Biochem.* 35:8698-8704; and Li et al., (1997) *Prot. Eng.* 10:1199-1204, the need still exists for providing glucoamylase variants with altered properties relative to their parent.

SUMMARY OF THE INVENTION

In one aspect, the present invention relates to glucoamylase variants having one or more amino acid substitutions at residues positions corresponding to positions 4, 5, 12, 24, 43, 44, 45, 46, 47, 49, 51, 70, 75, 6, 94, 100, 108, 114, 116, 119, 122, 124, 125, 137, 141, 143, 146, 148, 169, 171, 172, 175, 178, 180, 181, 208, 211, 228, 242, 243, 245, 292, 294,197, 309, 310, 313, 314, 315, 316, 317, 321, 340, 341, 350, 353, 356, 363, 368, 369, 375, 376, 395, 398, 401, 408, 409, 412, 415, 418, 421, 433, 436 and 451 of SEQ ID NO: 2 or 3 and/or an equivalent position in a parent glucoamylase. The equivalent position can be determined by sequence identity such that the parent glucoamylase has at least 80% sequence identity and less than 100% sequence identity with SEQ ID NOs: 1, 2, 3, 4, 5, 6, 7, 8, or 9. The parent glucoamylase can be one of SEQ ID NO: 1, 2 or 3. The equivalent position can be determined by structural identity to SEQ ID NO:3. A further aspect of the present invention is a glucoamylase variant having one or more amino acid substitutions corresponding to a position selected from positions 4, 5, 24, 29, 43, 49, 70, 75, 76, 100, 108, 119, 124, 137, 146, 148, 169, 171, 172, 175, 178, 181, 208, 211, 243, 292, 294, 297, 314, 316, 317, 340, 341, 350, 356, 363, 368, 369, 376, 395, 401, 412, 433, 436 and 451 and having at least 90% sequence identity to SEQ ID NO. 2. In some aspects, the one or more amino acid substitutions correspond to the following positions: 5, 24, 43, 49, 70, 75, 76, 94, 119, 141, 146, 148, 172, 175, 178, 180, 181, 208, 211, 243, 294, 309, 314, 353, 369, 375, 409. The parent glucoamylase can be any one of: a *Trichoderma* spp., an *Aspergillus* spp., a *Humicola* spp., a *Penicillium* spp., a *Talaromycese* spp., or a *Schizosaccharmyces* spp. In some aspects, the glucoamylase variant is preferably a *Trichoderma* spp. or an *Aspergillus* spp.

In further aspects of the invention, the glucoamylase variant includes a substitution in a position corresponding to at least one of the following positions: D4L/E/R/S/C/A/Q/W, F5C/M/N/R/S/T/V/W, I12L/R, D24E/L/Y/T, F29L/I/D/C/S/V/W, I43F/R/D/Y/S, D44E/H/K/S/N/Y/F/R, Y47W, Y49N, Q70R/K/M/P/G/L/F, Q75R/K/A, R76L/M/K/T/P, P94L, D100W/I/Q/M/P/A/N, N119P/T/Y/D/E, N146S/G/C/H/E/D/T/W/L/M, Q148V/Y/H/A/C/D/G/M/R/S/T, Y169D/F, Q172C/A/D/R/E/F/H/V/L/M/N/S/T/V, E180A/C/G/H/I/L/N/P/Q/R/S/T/V/Y, V181E/C/D/G/H/I/P/T/Y/S/K/F/A, Q208L/A/C/E/N/F/H/T, S211C/R/E/A/Y/W/M/H/L/I/R/Q/T, E243S/R/N/M/Y/A/L, R245A/E/M/I/P/V, I292D/H/P/R/T/N/V/F/L, G294D/E/T/Q/I/A, K297F/L/P/T/M/D/N/Q/A/Y/H/S/R/W, R309A/C/G/H/I/N/P/Q/S/T/W/Y/L, Y310E/G/L/P/S/W/R/Q, D313Q, V314A/R/N/D/C/E/Q/G/H/I/K/L/M/

F/P/S/T/W/Y, Y315F, Y316Q/R, N317T/H, K340D/T, K341F/D/P/V/G/S, T350S/E/A/N, Q356H/D/E, T363L/R/C/H/W, S368W/D/F/L, S369F, N376Q/T/H/S/V, Y395Q/R/S, A398S/I/T, S401C/V, R408S, N409W/T/K, T412A/h/K/G, R433H/Q, I436A/T, and S451M/T/H. some preferred variants have substitutions at position 172. Other preferred variants have substitutions at position 208 or 211. Other preferred variants have substitutions corresponding to Q172F, Q208N or S221R. Other preferred variants have at least one substitution at position 314. In some aspects, the variants have at least one substitution at position 24, 181, 208, 243, 292, 294, 353, 375 or 409. Some preferred substitutions are at positions D24E/L/Y, V181K/L, Q208C, E243Y I292V, G294A/Q, T353R, N375N/Q and/or N409K/W. In one aspect, the variant glucoamylase exhibits increased thermostability as compared to the parent glucoamylase. Alternatively, or in addition, the variant exhibits increased specific activity compared to the parent glucoamylase.

A further aspect of the invention is a polynucleotide encoding the variant described herein. A further aspect is a host cell containing the polynucleotide. A further aspect of the invention is an enzyme composition including the glucoamylase variant described herein. In one aspect, the enzyme composition is used in a starch conversion process or an animal feed formulation. In other aspects, the enzyme composition is used in an alcohol fermentation process.

A further aspect of the invention is a method of producing a variant glucoamylase in a host cell by transforming a host cell with a DNA construct comprising the polynucleotide encoding the variant glucoamylase; culturing the host cell under conditions suitable for the expression and production of the glucoamylase variant and producing the variant. The method may also include the step of recovering the glucoamylase variant from the culture.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1**A illustrates the *Trichoderma reesei* glucoamylase (TrGA) parent glucoamylase having 632 amino acids (SEQ ID NO: 1). The signal peptide is underlined, the catalytic region (SEQ ID NO:3) starting with amino acid residues SVDDFI (SEQ ID NO:160) and having 453 amino acid residues is in bold; the linker region is in italics and the binding domain is both italics and underlined. The mature protein which includes the catalytic domain (SEQ ID NO:3), linker region and starch binding domain is represented by SEQ ID NO:2. FIG. **1**B illustrates the cDNA (SEQ ID NO:4) which codes for the TrGA.

FIG. **2** illustrates the plasmid pDONR-TrGA which includes the cDNA (SEQ ID NO:4) of the parent TrGA.

FIG. **3**A illustrates the plasmids pREP3Y-DEST and FIG. **3**B illustrates the plasmids pREP3Y-TrGA.

FIG. **4**A and FIG. **4**B illustrate an alignment comparison of the catalytic domains of parent glucoamylases including glucoamylase derived from *Aspergillus awamori* (AaGA) (SEQ ID NO:5); *Aspergillus niger* (AnGA) (SEQ ID NO:6); *Aspergillus orzyae* (AoGA) (SEQ ID NO:7); *Trichoderma reesei* (TrGA) (SEQ ID NO:3); *Humicola grisea* (HgGA) (SEQ ID NO:8); and *Hypocrea vinosa* (HvGA) (SEQ ID NO:9). Identical amino acids are indicated by an asterisk (*).

FIG. **5**A illustrates the plasmid pTrex 3g-DEST and FIG. **5**B illustrates the plasmid pTrex3g-TrGA which was used as an expression vector for expression and production of variant glucoamylases in a *Trichoderma reesei* host.

FIG. **6**A and FIG. **6**B illustrate the Vmax (μM glucose/sec) comparison between the parent (wild-type) TrGA and variants, V314, S211R, Q172F and Q208N at 60° C. and 32° C. as further discussed in example 8.

FIG. **7** illustrates the activity of combinatorial mutants on starch.

FIG. **8** illustrates the Activity of single site mutants on corn starch.

FIG. **9** illustrates the GA activity of TrGA and the TrGA variant LR8 on a sample of corn mash liquefact (NE) from Example 10.

FIG. **10** illustrates the activity profile of TrGA and the TrGA variant LR8 on corn mash liquefact (BSE) from Example 10.

FIG. **11** illustrates the TrGA variant LR8 on soluble corn starch substrate.

FIG. **12** is a comparison of the three dimensional structures of *Trichoderma glucoamylase* (black) (SEQ ID NO:2) and *Aspergillus awamorii* glucoamylase (grey) viewed from the side.

FIG. **13** is a comparison of the three dimensional structures of *Trichoderma glucoamylase* (black) and *Aspergillus awamorii* glucoamylase (grey) viewed from the top.

DETAILED DESCRIPTION OF THE INVENTION

I. Definitions

Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. Singleton, et al., DICTIONARY OF MICROBIOLOGY AND MOLECULAR BIOLOGY, 2D ED., John Wiley and Sons, New York (1994), and Hale & Markham, THE HARPER COLLINS DICTIONARY OF BIOLOGY, Harper Perennial, N.Y. (1991) provide one of skill with the general meaning of many of the terms used herein. Still, certain terms are defined below for the sake of clarity and ease of reference.

As used herein, the term "glucoamylase (EC 3.2.1.3)" refers to an enzyme that catalyzes the release of D-glucose from the non-reducing ends of starch and related oligo- and polysaccharides.

The term "parent" or "parent sequence" refers to a sequence that is native or naturally occurring in a host cell.

The term "TrGA" refers to a parent *Trichoderma reesei* glucoamylase sequence having the mature protein sequence illustrated in SEQ ID NO:2 which includes the catalytic domain having the sequence illustrated in SEQ ID NO:3. The isolation, cloning and expression of the TrGA are described in WO 2006/060062 and U.S. Pat. Pub. No. 2006/0094080 published May 4, 2006 which are incorporated herein by reference. In some embodiments, the parent sequence refers to a TrGA that is the starting point for protein engineering. The numbering of the glucoamylase amino acids herein is based on the sequence of the TrGA (SEQ ID NO: 2 and SEQ ID NO: 3).

The phrase "mature form of a protein or polypeptide" refers to the final functional form of the protein or polypeptide. To exemplify, a mature form of the TrGA includes the catalytic domain, linker region and starch binding domain having the amino acid sequence of SEQ ID NO:2.

The term "*Trichoderma* glucoamylase homologues" refers to parent glucoamylases having at least 80% amino acid sequence identity to the TrGA sequence (SEQ ID NO:1, SEQ ID NO:2 or SEQ ID NO:3) and which glucoamylases retain the functional characteristics of a glucoamylase.

As used herein, a "homologous sequence" means a nucleic acid or polypeptide sequence having at least 100%,

at least 99%, at least 98%, at least 97%, at least 96%, at least 95%, at least 94%, at least 93%, at least 92%, at least 91%, at least 90%, at least 88%, at least 85%, at least 80%, at least 75%, at least 70%, at least 65%, at least 60%, at least 55%, at least 50%, or at least 45% sequence identity to a nucleic acid sequence or polypeptide sequence when optimally aligned for comparison, wherein the function of the candidate nucleic acid sequence or polypeptide sequence is essentially the same as the nucleic acid sequence or polypeptide sequence said candidate homologous sequence is being compared with. In some embodiments, homologous sequences have between 85% and 100% sequence identity, while in other embodiments there is between 90% and 100% sequence identity, and in other embodiments, there is 95% and 100% sequence identity. In some embodiments the candidate homologous sequence is compared with the TrGA nucleic acid sequence or mature protein sequence.

As used herein, the terms "glucoamylase variant", "variant" and "TrGA variant" are used in reference to glucoamylases that are similar to a parent glucoamylase sequence (e.g., the TrGA or *Trichoderma* glucoamylase homologues) but have at least one substitution, deletion or insertion in their amino acid sequence that makes them different in sequence from a parent glucoamylase.

As used herein the term "catalytic domain" refers to a structural region of a polypetide, which contains the active site for substrate hydrolysis.

The term "linker" refers to a short amino acid sequence generally having between 3 and 40 amino acids residues that covalently bind an amino acid sequence comprising a starch binding domain with an amino acid sequence comprising a catalytic domain.

The term "starch binding domain" refers to an amino acid sequence that binds preferentially to a starch substrate.

As used herein, the terms "mutant sequence" and "mutant gene" are used interchangeably and refer to a polynucleotide sequence that has an alteration in at least one codon occurring in a host cell's parent sequence. The expression product of the mutant sequence is a variant protein with an altered amino acid sequence relative to the parent. The expression product may have an altered functional capacity (e.g., enhanced enzymatic activity).

The term "property" or grammatical equivalents thereof in the context of a polypeptide, as used herein, refers to any characteristic or attribute of a polypeptide that can be selected or detected. These properties include, but are not limited to oxidative stability, substrate specificity, catalytic activity, thermal stability, pH activity profile, resistance to proteolytic degradation, K_M, K_{CAT}, K_{CAT}/K_M ratio, protein folding, ability to bind a substrate and ability to be secreted.

The term "property" of grammatical equivalent thereof in the context of a nucleic acid, as used herein, refers to any characteristic or attribute of a nucleic acid that can be selected or detected. These properties include, but are not limited to, a property affecting gene transcription (e.g., promoter strength or promoter recognition), a property affecting RNA processing (e.g., RNA splicing and RNA stability), a property affecting translation (e.g., regulation, binding of mRNA to ribosomal proteins).

The terms "thermally stable" and "thermostable" refer to glucoamylase variants of the present invention that retain a specified amount of enzymatic activity after exposure to identified temperatures over a given period of time under conditions prevailing during the hydrolysis of starch substrates, for example while exposed to altered temperatures.

The term "enhanced stability" in the context of a property such as thermostability refers to a higher retained starch hydrolytic activity over time as compared to other glucoamylases, variants and/or wild-type glucoamylases.

The term "diminished stability" in the context of a property such as thermostability refers to a lower retained starch hydrolytic activity over time as compared to other glucoamylases, variants and/or wild-type glucoamylase.

The terms "active" and "biologically active" refer to a biological activity associated with a particular protein. It follows that the biological activity of a given protein refers to any biological activity typically attributed to that protein by those skilled in the art. For example, an enzymatic activity associated with a glucoamylase is hydrolytic and, thus an active glucoamylase has hydrolytic activity.

The terms "polynucleotide" and "nucleic acid", used interchangeably herein, refer to a polymeric form of nucleotides of any length, either ribonucleotides or deoxyribonucleotides. These terms include, but are not limited to, a single-, double- or triple-stranded DNA, genomic DNA, cDNA, RNA, DNA-RNA hybrid, or a polymer comprising purine and pyrimidine bases, or other natural, chemically, biochemically modified, non-natural or derivatized nucleotide bases.

As used herein, the terms "DNA construct," "transforming DNA" and "expression vector" are used interchangeably to refer to DNA used to introduce sequences into a host cell or organism. The DNA may be generated in vitro by PCR or any other suitable technique(s) known to those in the art. The DNA construct, transforming DNA or recombinant expression cassette can be incorporated into a plasmid, chromosome, mitochondrial DNA, plastid DNA, virus, or nucleic acid fragment. Typically, the recombinant expression cassette portion of an expression vector, DNA construct or transforming DNA includes, among other sequences, a nucleic acid sequence to be transcribed and a promoter. In preferred embodiments, expression vectors have the ability to incorporate and express heterologous DNA fragments in a host cell.

As used herein, the term "vector" refers to a polynucleotide construct designed to introduce nucleic acids into one or more cell types. Vectors include cloning vectors, expression vectors, shuttle vectors, plasmids, cassettes and the like.

As used herein in the context of introducing a nucleic acid sequence into a cell, the term "introduced" refers to any method suitable for transferring the nucleic acid sequence into the cell. Such methods for introduction include but are not limited to protoplast fusion, transfection, transformation, conjugation, and transduction.

As used herein, the terms "transformed" and "stably transformed" refers to a cell that has a non-native (heterologous) polynucleotide sequence integrated into its genome or as an episomal plasmid that is maintained for at least two generations.

As used herein, the terms "selectable marker" and "selective marker" refer to a nucleic acid (e.g., a gene) capable of expression in host cells which allows for ease of selection of those hosts containing the vector. Typically, selectable markers are genes that confer antimicrobial resistance or a metabolic advantage on the host cell to allow cells containing the exogenous DNA to be distinguished from cells that have not received any exogenous sequence during the transformation.

As used herein, the term "promoter" refers to a nucleic acid sequence that functions to direct transcription of a downstream gene. The promoter, together with other transcriptional and translational regulatory nucleic acid sequences (also termed "control sequences") is necessary to express a given gene. In general, the transcriptional and

translational regulatory sequences include, but are not limited to, promoter sequences, ribosomal binding sites, transcriptional start and stop sequences, translational start and stop sequences, and enhancer or activator sequences.

A nucleic acid is "operably linked" when it is placed into a functional relationship with another nucleic acid sequence. For example, DNA encoding a secretory leader (i.e., a signal peptide), is operably linked to DNA for a polypeptide if it is expressed as a preprotein that participates in the secretion of the polypeptide. Generally, "operably linked" means that the DNA sequences being linked are contiguous, and, in the case of a secretory leader, contiguous and in reading phase.

As used herein the term "gene" refers to a polynucleotide (e.g., a DNA segment), that encodes a polypeptide and includes regions preceding and following the coding regions as well as intervening sequences (introns) between individual coding segments (exons).

As used herein, "homologous genes" refers to a pair of genes from different, but usually related species, which correspond to each other and which are identical or very similar to each other. The term encompasses genes that are separated by speciation (i.e., the development of new species) (e.g., orthologous genes), as well as genes that have been separated by genetic duplication (e.g., paralogous genes).

As used herein, "ortholog" and "orthologous genes" refer to genes in different species that have evolved from a common ancestral gene (i.e., a homologous gene) by speciation. Typically, orthologs retain the same function during the course of evolution. Identification of orthologs finds use in the reliable prediction of gene function in newly sequenced genomes.

As used herein, "paralog" and "paralogous genes" refer to genes that are related by duplication within a genome. While orthologs retain the same function through the course of evolution, paralogs evolve new functions, even though some functions are often related to the original one. Examples of paralogous genes include, but are not limited to genes encoding trypsin, chymotrypsin, elastase, and thrombin, which are all serine proteinases and occur together within the same species.

As used herein, "homology" refers to sequence similarity or identity, with identity being preferred. This homology is determined using standard techniques known in the art (See e.g., Smith and Waterman, Adv. Appl. Math., 2:482 [1981]; Needleman and Wunsch, J. Mol. Biol., 48:443 [1970]; Pearson and Lipman, Proc. Natl. Acad. Sci. USA 85:2444 [1988]; programs such as GAP, BESTFIT, FASTA, and TFASTA in the Wisconsin Genetics Software Package (Genetics Computer Group, Madison, Wis.); and Devereux et al., Nucl. Acid Res., 12:387-395 [1984]).

The "percent (%) nucleic acid sequence identity" or "percent (%) amino acid sequence identity" is defined as the percentage of nucleotide residues or amino acid residues in a candidate sequence that are identical with the nucleotide residues or amino acid residues of the starting sequence (i.e., TrGA).

Homologous sequences are determined by known methods of sequence alignment. A commonly used alignment method is BLAST described by Altschul et al., (Altschul et al., *J. Mol. Biol.,* 215:403-410, [1990]; and Karlin et al., Proc. Natl. Acad. Sci. USA 90:5873-5787 [1993]). A particularly useful BLAST program is the WU-BLAST-2 program (See, Altschul et al., Meth. Enzymol., 266:460-480 [1996]). WU-BLAST-2 uses several search parameters, most of which are set to the default values. The adjustable parameters are set with the following values: overlap span=1, overlap fraction=0.125, word threshold (T)=11. The HSP S and HSP S2 parameters are dynamic values and are established by the program itself depending upon the composition of the particular sequence and composition of the particular database against which the sequence of interest is being searched. However, the values may be adjusted to increase sensitivity. A % amino acid sequence identity value is determined by the number of matching identical residues divided by the total number of residues of the "longer" sequence in the aligned region. The "longer" sequence is the one having the most actual residues in the aligned region (gaps introduced by WU-Blast-2 to maximize the alignment score are ignored).

Other methods find use in aligning sequences. One example of a useful algorithm is PILEUP. PILEUP creates a multiple sequence alignment from a group of related sequences using progressive, pair-wise alignments. It can also plot a tree showing the clustering relationships used to create the alignment. PILEUP uses a simplification of the progressive alignment method of Feng and Doolittle (Feng and Doolittle, J. Mol. Evol., 35:351-360 [1987]). The method is similar to that described by Higgins and Sharp (Higgins and Sharp, CABIOS 5:151-153 [1989]). Useful PILEUP parameters including a default gap weight of 3.00, a default gap length weight of 0.10, and weighted end gaps.

The term "optimal alignment" refers to the alignment giving the highest percent identity score.

As used herein, the term "hybridization" refers to the process by which a strand of nucleic acid joins with a complementary strand through base pairing, as known in the art.

A nucleic acid sequence is considered to be "selectively hybridizable" to a reference nucleic acid sequence if the two sequences specifically hybridize to one another under moderate to high stringency hybridization and wash conditions. Hybridization conditions are based on the melting temperature (Tm) of the nucleic acid binding complex or probe. For example, "maximum stringency" typically occurs at about Tm−5° C. (5° below the Tm of the probe); "high stringency" at about 5-10° C. below the Tm; "intermediate stringency" at about 10-20° C. below the Tm of the probe; and "low stringency" at about 20-25° C. below the Tm. Functionally, maximum stringency conditions may be used to identify sequences having strict identity or near-strict identity with the hybridization probe; while an intermediate or low stringency hybridization can be used to identify or detect polynucleotide sequence homologs.

Moderate and high stringency hybridization conditions are well known in the art. An example of high stringency conditions includes hybridization at about 42° C. in 50% formamide, 5×SSC, 5×Denhardt's solution, 0.5% SDS and 100 μg/ml denatured carrier DNA followed by washing two times in 2×SSC and 0.5% SDS at room temperature and two additional times in 0.1×SSC and 0.5% SDS at 42° C. An example of moderate stringent conditions include an overnight incubation at 37° C. in a solution comprising 20% formamide, 5×SSC (150 mM NaCl, 15 mM trisodium citrate), 50 mM sodium phosphate (pH 7.6), 5×Denhardt's solution, 10% dextran sulfate and 20 mg/ml denaturated sheared salmon sperm DNA, followed by washing the filters in 1×SSC at about 37-50° C. Those of skill in the art know how to adjust the temperature, ionic strength, etc. as necessary to accommodate factors such as probe length and the like.

As used herein, "recombinant" includes reference to a cell or vector, that has been modified by the introduction of a heterologous or homologous nucleic acid sequence or that

the cell is derived from a cell so modified. Thus, for example, recombinant cells express genes that are not found in identical form within the native (non-recombinant) form of the cell or express native genes that are otherwise abnormally expressed, under expressed or not expressed at all as a result of deliberate human intervention.

In an embodiment of the invention, mutated DNA sequences are generated with site saturation mutagenesis in at least one codon. In another preferred embodiment, site saturation mutagenesis is performed for two or more codons. In a further embodiment, mutant DNA sequences have more than 50%, more than 55%, more than 60%, more than 65%, more than 70%, more than 75%, more than 80%, more than 85%, more than 90%, more than 95%, or more than 98% homology with the parent sequence. In alternative embodiments, mutant DNA is generated in vivo using any known mutagenic procedure such as, for example, radiation, nitrosoguanidine and the like. The desired DNA sequence is then isolated and used in the methods provided herein.

As used herein, "heterologous protein" refers to a protein or polypeptide that does not naturally occur in the host cell.

As used herein, "homologous protein" refers to a protein or polypeptide native or naturally occurring in a cell and includes native proteins that are over-expressed in the cell whether by recombinant DNA technology or naturally.

An enzyme is "over-expressed" in a host cell if the enzyme is expressed in the cell at a higher level than the level at which it is expressed in a corresponding wild-type cell.

The terms "protein" and "polypeptide" are used interchangeability herein. In the present disclosure and claims, the conventional one-letter and three-letter codes for amino acid residues are used. The 3-letter code for amino acids as defined in conformity with the IUPAC-IUB Joint Commission on Biochemical Nomenclature (JCBN). It is also understood that a polypeptide may be coded for by more than one nucleotide sequence due to the degeneracy of the genetic code.

Variants of the invention are described by the following nomenclature: [original amino acid residue/position/substituted amino acid residue]. For example the substitution of leucine for arginine at position 76 is represented as R76L. When more than one amino acid is substituted at a given position, the substitution is represented as 1) Q172C, Q172D or Q172R; 2) Q172C, D, or R or c) Q172C/D/R. When a position suitable for substitution is identified herein without a specific amino acid suggested, it is to be understood that any amino acid residue may be substituted for the amino acid residue present in the position. Where a variant glucoamylase contains a deletion in comparison with other glucoamylases the deletion is indicated with "*". For example, a deletion at position R76 is represented as R76*. A deletion of two or more consecutive amino acids is indicated for example as (76-78)*.

A "prosequence" is an amino acid sequence between the signal sequence and mature protein that is necessary for the secretion of the protein. Cleavage of the pro sequence will result in a mature active protein.

The term "signal sequence" or "signal peptide" refers to any sequence of nucleotides and/or amino acids which may participate in the secretion of the mature or precursor forms of the protein. This definition of signal sequence is a functional one, meant to include all those amino acid sequences encoded by the N-terminal portion of the protein gene, which participate in the effectuation of the secretion of protein. They are often, but not universally, bound to the N-terminal portion of a protein or to the N-terminal portion of a precursor protein. The signal sequence may be endogenous or exogenous. The signal sequence may be that normally associated with the protein (e.g., glucoamylase), or may be from a gene encoding another secreted protein.

The term "precursor" form of a protein or peptide refers to a mature form of the protein having a prosequence operably linked to the amino or carbonyl terminus of the protein. The precursor may also have a "signal" sequence operably linked, to the amino terminus of the prosequence. The precursor may also have additional polynucleotides that are involved in post-translational activity (e.g., polynucleotides cleaved therefrom to leave the mature form of a protein or peptide).

"Host strain" or "host cell" refers to a suitable host for an expression vector comprising DNA according to the present invention.

The terms "derived from" and "obtained from" refer to not only a glucoamylase produced or producible by a strain of the organism in question, but also a glucoamylase encoded by a DNA sequence isolated from such strain and produced in a host organism containing such DNA sequence. Additionally, the term refers to a glucoamylase which is encoded by a DNA sequence of synthetic and/or cDNA origin and which has the identifying characteristics of the glucoamylase in question.

A "derivative" within the scope of this definition generally retains the characteristic hydrolyzing activity observed in the wild-type, native or parent form to the extent that the derivative is useful for similar purposes as the wild-type, native or parent form. Functional derivatives of glucoamylases encompass naturally occurring, synthetically or recombinantly produced peptides or peptide fragments which have the general characteristics of the glucoamylases of the present invention.

The term "isolated" or "purified" refers to a material that is removed from its original environment (e.g., the natural environment if it is naturally occurring).

As used herein, the term, "combinatorial mutagenesis" refers to methods in which libraries of variants of a starting sequence are generated. In these libraries, the variants contain one or several mutations chosen from a predefined set of mutations. In addition, the methods provide means to introduce random mutations which were not members of the predefined set of mutations. In some embodiments, the methods include those set forth in U.S. Pat. No. 6,582,914, hereby incorporated by reference. In alternative embodiments, combinatorial mutagenesis methods encompass commercially available kits (e.g., QuikChange® Multisite, Stratagene, San Diego, Calif.).

As used herein, the term "library of mutants" refers to a population of cells which are identical in most of their genome but include different homologues of one or more genes. Such libraries can be used, for example, to identify genes or operons with improved traits.

As used herein the term "dry solids content (DS or ds)" refers to the total solids of a slurry in % on a dry weight basis.

As used herein, the term "initial hit" refers to a variant that was identified by screening a combinatorial consensus mutagenesis library. In preferred embodiments, initial hits have improved performance characteristics, as compared to the starting gene.

As used herein, the term "improved hit" refers to a variant that was identified by screening an enhanced combinatorial consensus mutagenesis library.

As used herein, the term "target property" refers to the property of the starting gene that is to be altered. It is not

intended that the present invention be limited to any particular target property. However, in some preferred embodiments, the target property is the stability of a gene product (e.g., resistance to denaturation, proteolysis or other degradative factors), while in other embodiments, the level of production in a production host is altered. Indeed, it is contemplated that any property of a starting gene will find use in the present invention.

Other definitions of terms may appear throughout the specification

Before the exemplary embodiments are described in more detail, it is to be understood that this invention is not limited to particular embodiments described, as such may, of course, vary. It is also to be understood that the terminology used herein is for the purpose of describing particular embodiments only, and is not intended to be limiting, since the scope of the present invention will be limited only by the appended claims.

Where a range of values is provided, it is understood that each intervening value, to the tenth of the unit of the lower limit unless the context clearly dictates otherwise, between the upper and lower limits of that range is also specifically disclosed. Each smaller range between any stated value or intervening value in a stated range and any other stated or intervening value in that stated range is encompassed within the invention. The upper and lower limits of these smaller ranges may independently be included or excluded in the range, and each range where either, neither or both limits are included in the smaller ranges is also encompassed within the invention, subject to any specifically excluded limit in the stated range. Where the stated range includes one or both of the limits, ranges excluding either or both of those included limits are also included in the invention.

Although any methods and materials similar or equivalent to those described herein can be used in the practice or testing of the present invention, exemplary and preferred methods and materials are now described. All publications mentioned herein are incorporated herein by reference to disclose and describe the methods and/or materials in connection with which the publications are cited.

It must be noted that as used herein and in the appended claims, the singular forms "a", "an", and "the" include plural referents unless the context clearly dictates otherwise. Thus, for example, reference to "a gene" includes a plurality of such candidate agents and reference to "the cell" includes reference to one or more cells and equivalents thereof known to those skilled in the art, and so forth.

The publications discussed herein are provided solely for their disclosure prior to the filing date of the present application. Nothing herein is to be construed as an admission that the present invention is not entitled to antedate such publication by virtue of prior invention.

Preferred Embodiments

An objective of the present invention was to alter properties, such as improve the thermal stability and/or specific activity of parent glucoamylases and in particular *Trichoderma reesei* glucoamylase (TrGA), wherein the glucoamylase variants having altered, such as improved, properties would be useful, for example in starch conversion or alcohol fermentation processes.

Parent Glucoamylases:

In some embodiments, the present invention provides a glucoamylase variant. The glucoamylase variant is a variant of a parent glucoamylase, said parent glucoamylase comprising an amino acid sequence as illustrated in SEQ ID NO:1, 2, 3, 5, 6, 7, 8 or 9 or said parent glucoamylase comprising a catalytic domain having an amino acid sequence displaying at least 80% sequence identity with one or more of the amino acid sequences illustrated in SEQ ID NO:1, 2, 3, 5, 6, 7, or 8 and/or encoded by a DNA sequence which hybridizes under medium, high or stringent conditions with a DNA encoding a glucoamylase having one of the amino acid sequences of SEQ ID NO: 1, 2 or 3.

Predicted structure and known sequences of glucoamylases are conserved among fungal species (Coutinho et al., 1994 Protein Eng., 7:393-400 and Coutinho et al., 1994, Protein Eng., 7: 749-760). In some embodiments, the parent glucoamylase is a filamentous fungal glucoamylase. In some embodiments, the parent glucoamylase is obtained from a *Trichoderma* strain (e.g., *T. reesei, T. longibrachiatum, T. strictipilis, T. asperellum, T. konilangbra* and *T. hazianum*), an *Aspergillus* strain (e.g. *A. niger, A. nidulans, A. kawachi, A. awamori* and *A. orzyae*), a *Talaromyces* strain (e.g. *T. emersonii, T. thermophilus*, and *T. duponti*), a Hypocrea strain (e.g. *H. gelatinosa, H. orientalis, H. vinosa*, and *H. citrina*), a *Fusarium* strain (e.g., *F. oxysporum, F. roseum*, and *F. venenatum*), a *Neurospora* strain (e.g., *N. crassa*) and a *Humicola* strain (e.g., *H. grisea, H. insolens* and *H. lanuginose*), a *Penicillium* strain (e.g. *P. notatum* or *P. chrysogenum*), or a *Saccharomycopsis* strain (e.g. *S. fibuligera*).

In some embodiments, the parent glucoamylase may be a bacterial glucoamylase. For example, the polypeptide may be obtained from a gram positive bacterial strain such as *Bacillus* (e.g., *B. alkalophilus, B. amyloliquefaciens, B. lentus, B. licheniformis, B. stearothermophilus, B. subtilis* and *B. thuringiensis*) or a *Streptomyces* strain (e.g., *S. lividans*).

In some embodiments, the parent glucoamylase will have at least 80% sequence identity, at least 85% sequence identity, at least 88% sequence identity, at least 90% sequence identity, at least 93% sequence identity, at least 95% sequence identity, at least 96% sequence identity, at least 97% sequence identity, at least 98% sequence identity and also at least 99% sequence identity with the TrGA amino acid sequence of SEQ ID NO: 2.

In other embodiments, the parent glucoamylase will have at least 80% sequence identity, at least 85% sequence identity, at least 90% sequence identity, at least 95% sequence identity, at least 97% sequence identity and also at least 98% sequence identity with the catalytic domain of the TrGA amino acid sequence of SEQ ID NO:3.

In yet other embodiments, the parent glucoamylase will comprise an amino acid sequence having at least 90% sequence identity, at least 93% sequence identity, at least 95% sequence identity, at least 96% sequence identity, at least 97% sequence identity, at least 98% sequence identity and also at least 99% sequence identity with the catalytic domain of the *Aspergillus* parent glucoamylase of SEQ ID NO:5 or SEQ ID NO:6.

In other embodiments, the parent glucoamylase will comprise an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, at least 97% sequence identity and also at least 99% sequence identity with the catalytic domain of the *Humicola grisea* (HgGA) parent glucoamylase of SEQ ID NO:8.

In further embodiments, a *Trichoderma* glucoamylase homologue will be obtained from a *Trichoderma* or *Hypocrea* strain. Some preferred *Trichoderma* glucoamylase homologues are described in US Pat. Pub. No. 2006/0094080 and reference is made specifically to amino acid sequences set forth in SEQ ID NOs: 17-22 and 43-47 of said reference.

In some preferred embodiments, the parent glucoamylase is TrGA comprising the amino acid sequence of SEQ ID NO:2 or a *Trichoderma* glucoamylase homologue having at least 80%, at least 85%, at least 88%, at least 90%, at least 93%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99% sequence identity to the TrGA sequence.

Glucoamylase Structural Homology:

The central dogma of molecular biology is that the sequence of DNA encoding a gene for a particular enzyme, determines the amino acid sequence of the protein, this sequence in turn determines the three-dimensional folding of the enzyme. This folding brings together disparate residues that create a catalytic center and substrate binding surface and this results in the high specificity and activity of the enzymes in question.

Glucoamylases consist of as many as three distinct structural domains, a catalytic domain of approximately 450 residues which is structurally conserved in all glucoamylases, generally followed by a linker region consisting of between 30 and 80 residues which are connected to a starch binding domain of approximately 100 residues. The structure of the *Trichoderma reesei* glucoamylase with all three regions intact was determined to 1.8 Angstrom resolution herein (see Table 15 and Example 11). Using the coordinates (see Table 15) the structure was aligned with the coordinates of the catalytic domain from *Aspergillus awamorii* strain X100 that was determined previously (Aleshin, A. E., Hoffman, C., Firsov, L. M., and Honzatko, R. B. 1994 Refined crystal structures of glucoamylase from *Aspergillus awamori* var. X100. *J Mol Biol* 238: 575-591.). The *Aspergillus awamori* crystal structure only included the catalytic domain. As seen in FIGS. **12** and **13** the structure of the catalytic domains overlap very closely and it is possible to identify equivalent residues based on this structural superposition. The inventors believe that all glucoamylases share the basic structure depicted in FIGS. **12** and **13**.

FIG. **12** is a comparison of the three dimensional structures of the *Trichoderma* Glucoamylase (black) of SEQ ID NO:1 (see FIG. **1** for amino acid sequence) and of *Aspergillus awamorii* (grey) viewed from the side. In this view the relationship between the catalytic domain and the linker region and the starch binding domain can be seen.

FIG. **13** is a comparison of the three dimensional structures of the *Trichoderma* glucoamylase (black) and of *Aspergillus awamorii* (grey) viewed from the top. The glucoamylases shown here and indeed all known glucoamylases to date share this structural homology. The conservation of structure correlates with the conservation of activity and a conserved mechanism of action for all glucoamylases. Given this high homology, changes resulting from site specific variants of the *Trichoderma glucoamylase* resulting in altered function would also have similar structural and therefore functional consequences in other glucoamylases. Therefore, the teachings of which variants result in desirable benefits can be applied to other glucoamylases.

Thus, the amino acid position numbers discussed herein refer to those assigned to the mature *Trichoderma reesei* glucoamylase sequence presented in FIG. **1**. The present invention, however, is not limited to the variants of *Trichoderma* glucoamylase, but extends to glucoamylases containing amino acid residues at positions which are "equivalent" to the particular identified residues in *Trichoderma reesei* glucoamylase (SEQ ID NO:2). In a preferred embodiment of the present invention, the parent glucoamylase is *Taleromyces* GA and the substitutions are made at the equivalent amino acid residue positions in *Taleromyces* glucoamylase as those described herein. In other embodiments, the parent glucoamylase is one of those listed in Table 1. In further embodiments, the parent glucoamylase is a *Penicillium* glucoamylase, such as *Penicillium chrysogenum,*

Structural identity determines whether the amino acid residues are equivalent. Structural identity is a one-to-one topological equivalent when the two structures (three dimensional and amino acid structures) are aligned. A residue (amino acid) position of a glucoamylase is equivalent to a residue of *T. reesei* glucoamylase if it is either homologous (i.e., corresponding in position in either primary or tertiary structure) or analogous to a specific residue or portion of that residue in *T. reesei* glucoamylase (having the same or similar functional capacity to combine, react, or interact chemically).

In order to establish identity to the primary structure, the amino acid sequence of a glucoamylase can be directly compared to *Trichoderma reesei* glucoamylase primary sequence and particularly to a set of residues known to be invariant in glucoamylases for which sequence is known. For example, FIGS. **4**A and B herein shows the conserved residues between glucoamylases. After aligning the conserved residues, allowing for necessary insertions and deletions in order to maintain alignment (i.e. avoiding the elimination of conserved residues through arbitrary deletion and insertion), the residues equivalent to particular amino acids in the primary sequence of *Trichoderma reesei* glucoamylase are defined. Alignment of conserved residues preferably should conserve 100% of such residues. However, alignment of greater than 75% or as little as 50% of conserved residues is also adequate to define equivalent residues.

For example, in FIG. **4**, glucoamylases from six organisms are aligned to provide the maximum amount of homology between amino acid sequences. A comparison of these sequences shows that there are a number of conserved residues contained in each sequence as designated by an asterisk. These conserved residues, thus, may be used to define the corresponding equivalent amino acid residues of *Trichoderma reesei* glucoamylase in other glucoamylases such as glucoamylase from *Aspergillus niger.*

Structural identity involves the identification of equivalent residues between the two structures. "Equivalent residues" can be defined by determining homology at the level of tertiary structure (structural identity) for an enzyme whose tertiary structure has been determined by x-ray crystallography. Equivalent residues are defined as those for which the atomic coordinates of two or more of the main chain atoms of a particular amino acid residue of the *Trichoderma reesei* glucoamylase (N on N, CA on CA, C on C and 0 on 0) are within 0.13 nm and preferably 0.1 nm after alignment. Alignment is achieved after the best model has been oriented and positioned to give the maximum overlap of atomic coordinates of non-hydrogen protein atoms of the glucoamylase in question to the *Trichoderma reesei* glucoamylase. The best model is the crystallographic model giving the lowest R factor for experimental diffraction data at the highest resolution available.

$$R\ \text{factor} = \frac{\sum_h |Fo(h)| - |Fc(h)|}{\sum_h |Fo(h)|}$$

Equivalent residues which are functionally analogous to a specific residue of *Trichoderma reesei* glucoamylase are defined as those amino acids of the enzyme which may adopt

a conformation such that they either alter, modify or contribute to protein structure, substrate binding or catalysis in a manner defined and attributed to a specific residue of the *Trichoderma reesei* glucoamylase. Further, they are those residues of the enzyme (for which a tertiary structure has been obtained by x-ray crystallography) which occupy an analogous position to the extent that, although the main chain atoms of the given residue may not satisfy the criteria of equivalence on the basis of occupying a homologous position, the atomic coordinates of at least two of the side chain atoms of the residue lie with 0.13 nm of the corresponding side chain atoms of *Trichoderma reesei* glucoamylase. The coordinates of the three dimensional structure of *Trichoderma reesei* glucoamylase are set forth in Table 15 and can be used as outlined above to determine equivalent residues on the level of tertiary structure.

Some of the residues identified for substitution are conserved residues whereas others are not. In the case of residues which are not conserved, the substitution of one or more amino acids is limited to substitutions which produce a variant which has an amino acid sequence that does not correspond to one found in nature. In the case of conserved residues, such substitutions should not result in a naturally-occurring sequence.

Variants:

The variants according to the invention include at least one substitution, deletion or insertion in the amino acid sequence of a parent glucoamylase that makes the variant different in sequence from the parent glucoamylase. In some embodiments, the variants of the invention will have at least 20%, at least 40%, at least 60%, at least 80%, at least 85%, at least 90%, at least 95% and also at least 100% of the glucoamylase activity of the TrGA activity of SEQ ID NO:2.

In some embodiments, the variants according to the invention will comprise a substitution, deletion or insertion in at least one amino acid position of the parent TrGA (SEQ ID NO:2), or in an equivalent position in the sequence of another parent glucoamylase having at least 90% sequence identity to the TrGA sequence, including but not limited to; at least 93% sequence identity, at least 95%, at least 97%, and at least 99%.

In other embodiments, the variant according to the invention will comprise a substitution, deletion or insertion in at least one amino acid position of a fragment of the parent TrGA, wherein the fragment comprises the catalytic domain of the TrGA sequence (SEQ ID NO:3) or in an equivalent position in a fragment comprising the catalytic domain of a parent glucoamylase having at least 80% sequence identity to the fragment of the TrGA sequence, at least 90%, at least 95%, at least 97%, and at least 99%. In some embodiments, the fragment will comprise at least 400, 425, 450, and/or 500 amino acid residues. In some embodiments when the parent glucoamylase includes not only a catalytic domain, linker region and starch binding domain, the fragment may include part of the linker region. In a particularly preferred embodiment, the variant will comprise a substitution, deletion or insertion in the amino acid sequence of a fragment of the TrGA sequence (SEQ ID NO: 2 or SEQ ID NO: 3).

Structural identity with reference to an amino acid substitution, means that the substitution occurs at the equivalent amino acid position in the homologous glucoamylase or parent glucoamylase. The term equivalent position means a position that is common to two parent sequences which is based on an alignment of the amino acid sequence of the parent glucoamylase in question as well as alignment of the three-dimensional structure of the parent glucoamylase in question with the TrGA reference glucoamylase amino acid sequence and three-dimensional sequence. For example, with reference to FIG. **4**, position 24 in TrGA (SEQ ID NO: 3) is D24 and the equivalent position for *Aspergillus niger* (SEQ ID NO. 6) is position D25 and the equivalent position for *Aspergillus oryzea* (SEQ ID NO: 7) is position D26. See FIGS. **12** and **13** for an exemplary alignment of the three-dimensional sequence.

In some embodiments, the glucoamylase variant will include at least one substitution in the amino acid sequence of a parent. In further embodiments, the variant may have more than one substitution (e.g. two, three or four substitutions).

In some embodiments, a glucoamylase variant comprises a substitution, deletion or insertion, and preferably a substitution in at least one amino acid position in a position corresponding to the regions of non-conserved amino acids as illustrated in FIG. **4** (e.g. amino acid positions corresponding to those positions which are not designated by"*" in FIG. **4**).

While the variants can be in any position in the mature protein sequence (SEQ ID NOS: 2 or 3), in one embodiment, a glucoamylase variant comprises one or more substitutions in the following positions in the amino acid sequence set forth in SEQ ID NO: 2 or 3: 4, 5, 12, 24, 29, 43, 44, 45, 46, 47, 49, 51, 70, 75, 76, 94, 100, 108, 114, 116, 119, 122, 124, 125, 137, 143, 146, 148, 169, 171, 172, 175, 178, 180, 181, 208, 211, 228, 242, 243, 245, 292, 294, 297, 309, 310, 313, 314, 315, 316, 317, 321, 340, 341, 350, 353, 356, 363, 368, 369, 375, 376, 395, 398, 401, 408, 409, 412, 415, 418, 421, 433, 436, and 451; and/or in an equivalent position in a parent glucoamylase. In some embodiments, the parent glucoamylase will have at least 90%, at least 95%, at least 96%, at least 97% at least 98%, and at least 99% identity with SEQ ID NO: 2 or SEQ ID NO: 3. In other embodiments the parent glucoamylase will be a *Trichoderma* glucoamylase homologue.

In some embodiments, the glucoamylase variant comprises one or more substitutions in the following positions in the amino acid sequence set forth in SEQ ID NO: 2 or 3: D4, F5, 112, D24, F29, 143, D44, P45, D46, Y47, Y49, W51, Y70, Q75, R76, P94, D100, K108, K114, F116, N119, R122, Q124, R125, G137, N146, Q148, Y169, N171, Q172, F175, W178, E180, V181, Q208, 5211, W228, N242, E243, R245, 1292, G294, K297, R309, Y310, D3B, V314, Y315, Y316, N317, W321, K340, K341, T350, Q356, T363, S368, 5369, N376, Y395, A398, 5401, R408, N409, T412, H418, W421, R433, 1436, and/or 5451 and/or an equivalent position in parent glucoamylase (e.g. a *Trichoderma* glucoamylase homologue).

In other embodiments, the variant of a glucoamylase parent comprises one or more substitutions in the following positions in the amino acid sequence set forth in SEQ ID NO:2 or 3: 4, 5, 24, 29, 43, 44, 49, 70, 75, 76, 100, 108, 119, 124, 137, 146, 148, 169, 171, 172, 175, 178, 181, 208, 211, 243, 292, 294, 297, 314, 316, 317, 340, 341, 350, 356, 363, 368, 369, 376, 395, 401, 409, 412, 433, 436, and/or 451 and/or an equivalent position in a parent glucoamylase (e.g., *Trichoderma* glucoamylase homologue).

In further embodiments, the variant of a glucoamylase parent comprises at least one of the following substitutions in the following positions in an amino acid sequence set forth in SEQ ID NO:2 or 3: D4L/E/R/S/C/A/Q/W, F5C/M/N/R/S/T/V/W, I12L/R, D24E/L/Y/T, F29L/I/D/C/S/V/W, I43F/R/D/Y/S, D44E/H/K/S/N/Y/F/R, Y47W,Y49N, Q70R/K/M/P/G/L/F, Q75R/K/A, R76L/M/K/T/P, P94L, D100W/I/Q/M/P/A/N, N119P/T/Y/D/E, N146S/G/C/H/E/D/T/W/L/F/M, Q148V/Y/H/A/C/D/G/M/R/S/T, Y169D/F, Q172C/A/

D/R/E/F/H/V/L/M/N/S/T/V, F175H/A/G/R/S/T/C/W/Y, W178A/C/D/E/F/G/H/K/N/R/S/T/V/Y, E180A/C/G/H/I/L/N/P/Q/R/S/T/V/Y/, V181E/C/D/G/H/I/P/T/Y/S/L/K/F/A, Q208L/A/C/E/N/F/H/T, S211C/R/E/A/Y/W/M/H/L/I/R/Q/T, E243S/R/N/M/Y/A/L, R245A/E/M/I/P/V, I292D/H/P/R/T/N/V/F/L, G294D/E/T/Q/I/A, K297F/L/P/T/M/D/N/Q/A/Y/H/S/R/W, R309A/C/G/H/I/N/P/Q/S/T/W/Y/L, Y310E/G/L/P/S/W/R/Q, D313Q, V314A/R/N/D/C/E/Q/G/H/I/L/K/M/F/P/S/T/W/Y, Y315F, Y316Q/R, N317T/H, K340D/T, K341F/D/P/V/G/S, T350S/E/A/N, Q356H/D/E, T363L/R/C/H/W, S368W/D/F/L, S369F, N376Q/T/H/S/V, Y395Q/R/S, A398S/I/T, S401C/V, R408S, N409W/T/K, T412A/H/K/G, R433H/Q, I436A/T, S451M/T/H/and/or a substitution in an equivalent position in a parent glucoamylase homologue.

In some preferred embodiments, the glucoamylase variant comprises at least one substitution in a position corresponding to the amino acid residue position set forth in SEQ ID NO:2: of 5, 24, 43, 49, 70, 75, 76, 94, 119, 146, 148, 172, 175, 178, 180, 181, 208, 211, 245, 294, 353, 315, 375, 409, 309, 314, 369, 412 and/or an equivalent position in a homologous parent glucoamylase.

In some particularly preferred embodiments, the glucoamylase variant comprises at least one substitution selected from the group consisting of FSW, D24E, I43R, I43Y, I43S, I43F, Y47W, Y49N, Q70K, Q75R, R76L, P94L, N119P/T/Y/D, N146S/D/T/E/W/L, Q148V N171D, Q172C/D/R/E/F/V/L/T, F175R/W/Y, W178K/N/Y, E180H/N/V/R, V181E/F/G/I/H, Q208A/T/N, S211H/M/L/R, R245E, R245M, R309W, V314F/G/H/K/P/R/Y, Y315F, S369F, T412K corresponding to the position set forth in SEQ ID NO:2 or 3 and/or an equivalent position in a homologous parent glucoamylase.

In further particular embodiments, the glucoamylase variant comprises at least one substitution of an amino acid residue selected from the positions corresponding to position 5, 43, 75, 76, 94, 108, 119, 124, 146, 148, 171, 172, 175, 178, 180, 181, 208, 211, 297, 314, 316, or 412 of SEQ ID NO: 2 or 3 and/or an equivalent position in a *Trichoderma* glucoamylase homologue. In some preferred embodiments, the substitution is at a position corresponding to position number 148, 172, 175, 178, 180, 208, 211, 314, 412 or 297 of SEQ ID NO:2 or 3 and/or an equivalent position in a *Trichoderma* glucoamylase homologue.

In some particularly preferred embodiments, the substitution is at a position corresponding to position number 108, 124, 171, 172, 208, 211, 314 or 316 of SEQ ID NO:2 or a homologous parent glucoamylase (e.g., *Trichoderma* glucoamylase homologue).

In some embodiments, the glucoamylase variants comprise multiple substitutions. Some of the multiple substitutions will include a substitution at one or more of the positions equivalent to and including the positions 24, 43, 44, 108, 124, 171, 175, 181, 208, 243, 292, 294, 297, 310, 314 and 363 of SEQ ID NO:2 or 3. Some preferred multiple substitutions will include one or more of the positions equivalent to and corresponding to positions 108, 124, 171, 208, 211 and 314 of SEQ ID NO:2 or 3. In some embodiments, the glucoamylase variants comprise multiple substitutions, such as Y47W and Y315F or Y47F and Y315W.

Some examples of multiple substitutions include substitutions at positions:

D24/I43/D44/F175/V181/V314/T363;

D24/Q208/I292/G294/K297/Y310;

V181/E243/1292/k297/N317/Y395;

D24/V181/Q208/G294/T363/N376/N409;

D24/V181/I292/G294/E243/N409; and

I43R/E243/I292/G294/K297 of SEQ ID NO:2 or 3 and equivalent positions in parent glucoamylases and particularly *Trichoderma* glucoamylase homologues.

Some preferred multiple substitutions include the substitutions:

D24E,L/I43F,R/D44H,N/F175H/V181K,L/V314D,H,K/T363R;

D24L,W,Y/Q208F/I292F,N,V/G294A,I,Q/K297A/Y310F,Q,R;

V181F,K,L/E243A,N,M,R,Y/I292F,L,N,V/K297A,D,H,M,N,Q/N317H/Y395Q,R

D24E,L,Y/V181F,K,L/Q208C,F/G294A,I,Q/T363R/N376Q/N409K,W;

D24E,L,Y/V181F,K,L/I292F,L,N,V/G294A,I,Q/E243A,M,N,R,Y/N409K,W; and I43R/E243A,M,N,R,Y/I292F,L,N,V/G294A/K297A,D,H,M,N,Q,S,R,W,Y of SEQ ID NO:2 or 3 and equivalent positions in parent glucoamylases and particularly *Trichoderma* glucoamylase homologue.

A number of parent glucoamylases have been aligned with the amino acid sequence of TrGA. FIG. **4** includes the catalytic domain of the following parent glucoamylases *Aspergillus awamori* (AaGA) (SEQ ID NO:5); *Aspergillus niger* (AnGA) (SEQ ID NO:6); *Aspergillus* orzyae (AoGA) (SEQ ID NO:7), *Humicola grisea* (HgGA) (SEQ ID NO:8) and *Hypocrea vinosa* (HvGA) (SEQ ID NO:9). The % identity of the catalytic domains is represented in Table 1 below. In some embodiments, for example, the variant glucoamylase will be derived from a parent glucoamylase which is an *Aspergillus glucoamylase* and the variant will include at least one substitution in a position equivalent to a position set forth in SEQ ID NO:2 or 3 and particularly in a position corresponding to D4, F5, 112, D24, F29, 143, D44, P45, D46, Y47, Y49, W51, Y70, Q75, R76, P94, D100, K108, K114, F116, N119, R122, Q124, R125, G137, N146, Q148, Y169, N171, Q172, F175, W178, E180, V181, Q208, 5211, W228, N242, E243, R245, 1292, G294, K297, R309, Y310, D313, V314, Y315, Y316, N317, W321, K340, K341, T350, Q356, T363, S368, S369, N376, Y395, A398, S401, R408, N409, T412, H418, W421, R433, I436, and/or S451.

Endo-H removal of N-linked sugars in the *Trichoderma reesei* glucoamylase had a stabilizing effect (when looking at Tm). Thus, variants having an N171D substitution can have increased thermostability as compared to wildtype. In some embodiments, variants having one or more substitutions at sites having N-linked sugars are provided, including N171D in *Trichoderma reesei* (SEQ ID NO:2).

TABLE 1

	AaGA	AnGA	AoGA	HgGA	HvGA	TrGA
AaGA	100	95	58	53	57	56
AnGA		100	59	53	57	56
AoGA			100	55	56	56
HgGA				100	61	63
HvGA					100	91
TrGA						100

The present invention also provides glucoamylase variants having at least one altered property (e.g., improved property) as compared to a parent glucoamylase and particularly to the TrGA. In some preferred embodiments, at least one altered property (e.g. improved property) is selected from the group consisting of acid stability, thermal stability and specific activity. Preferably, the altered property is increased acid stability, increased thermal stability and/or increased specific activity. Preferably, the increased thermal stability is at higher temperatures. In one embodiment, the

increased pH stability is at high pH. In a further embodiment, the increased pH stability is at low pH.

The glucoamylase variants of the invention may also provide higher rates of starch hydrolysis at low substrate concentrations as compared to the parent glucoamylase. The variant may have a higher Vmax or lower Km than a parent glucoamylase when tested under the same conditions. For example the variant glucoamylase may have a higher Vmax at a temperature range of 25° C. to 70° C. (e.g. at 25° C. to 35° C.; 30° C.-35° C.; 40° C. to 50° C.; at 50° C. to 55° C. and at 55° C. to 62° C.). The Michaelis-Menten constant, Km and Vmax values can be easily determined using standard known procedures.

Thermal Stability (Thermostabile Variants):

In one aspect, the invention relates to a variant glucoamylase having altered thermal stability at altered temperatures as compared to a parent or wild type. Altered temperatures include increased or decreased temperatures. In some embodiments, the glucoamylase variant will have improved thermostability such as retaining at least 50%, 60%, 70%, 75%, 80%, 85%, 90%, 92%, 95%, 96%, 97%, 98% or 99% enzymatic activity after exposure to altered temperatures over a given time period, for example, at least 60 minutes, 120 minutes, 180 minutes, 240 minutes, 300 minutes, etc. In some embodiments, the variant has increased thermal stability compared to the parent glucoamylase at selected temperatures in the range of 40 to 80° C., also in the range of 50 to 75° C. and in the range of 60 to 70° C., and preferably at a pH range of 4.0 to 6.0. In some embodiments, the thermostability is determined as described in the Examples.

In some embodiments, particularly interesting variants in connection with an improvement in thermostability include one or more deletions, substitutions or insertions and particularly substitutions in the following positions in the amino acid sequence set forth in SEQ ID NO:2 or 3: D4, F5, 112, D24, F29, 143, D44, P45, D46, Y47, Y49, W51, Y70, Q75, R76, P94, D100, K108, K114, F116, N119, R122, Q124, R125, G137, N146, Q148, Y169, N171, Q172, F175, W178, E180, V181, Q208, 5211, W228, N242, E243, R245, 1292, G294, K297, R309, Y310, D313, V314, Y315, Y316, N317, W321, K340, K341, T350, Q356, T363, 5368, 5369, N376, Y395, A398, 5401, R408, N409, T412, H418, W421, R433, 1436, and/or 5451 and/or an equivalent position in a parent glucoamylase. In some preferred embodiments, the parent glucoamylase will be a *Trichoderma* glucoamylase homologue and in further preferred embodiments, the parent glucoamylase will have at least 90%, at least 95% and at least 98% sequence identity to SEQ ID NO:2 or 3.

Chimeric Glucoamylases:

Glucoamylase variants of the invention may also include chimeric or hybrid glucoamylases with, for example a starch binding domain (SBD) from one glucoamylase and a catalytic domain and linker from another. For example, a hybrid glucoamylase can be made by swapping the SBD from AnGA with the SBD from TrGA, making a hybrid with the AnGA SBD and the TrGA catalytic domain and linker. Alternatively, the SBD and linker from AnGA can be swapped for the SBD and linker of TrGA.

Specific Activity:

In another aspect, the invention relates to a variant glucoamylase having altered specific activity as compared to a parent or wildtype glucoamylase.

In some embodiments, particularly interesting variants in connection with an improvement in specific activity include one or more deletions, substitutions or insertions and particularly substitutions in the following positions in the amino acid sequence set forth in SEQ ID NO:2 or 3: D4, F5, 112, D24, F29, 143, D44, P45, D46, Y47, Y49, W51, Y70, Q75, R76, P94, D100, K108, K114, F116, N119, R122, Q124, R125, G137, N146, Q148, Y169, N171, Q172, F175, W178, E180, V181, Q208, 5211, W228, N242, E243, R245, 1292, G294, K297, R309, Y310, D313, V314, Y315, Y316, N317, W321, K340, K341, T350, Q356, T363, 5368, 5369, N376, Y395, A398, 5401, R408, N409, T412, H418, W421, R433, 1436, and/or 5451 and/or an equivalent position in a parent glucoamylase. In some embodiments, variants of the invention having improved specific activity include a substitution in the following positions in the amino acid sequence set forth in SEQ ID NO: 2 or 3: D4, D24, 143, D44, Y70, Q75, R76, D100, K108, N119, Q124, N146, Q148, N171, Q172, F175, V181, Q208, S211, E243, R245, 1292, G294, K297, V314, Y316, N317, K340, K341, T350, Q356, T363, S368, N376, Y395, A398, 5401, N409, T412, I436, and/or S451 and/or an equivalent position in a parent glucoamylase. In some preferred embodiments, the parent glucoamylase will comprise a sequence having at least 90% or 95% sequence identity to the sequence of SEQ ID NO:2 or 3.

Polynucleotides:

The present invention also relates to isolated polynucleotides encoding a variant glucoamylase of the invention. The polynucleotides encoding a variant glucoamylase may be prepared by established techniques known in the art. The polynucleotides may be prepared synthetically, such as by an automatic DNA synthesizer. The DNA sequence may be of mixed genomic (or cDNA) and synthetic origin prepared by ligating fragments together. The polynucleotides may also be prepared by polymerase chain reaction (PCR) using specific primers. In general, reference is made to Minshull J., et al., (2004), Engineered protein function by selective amino acid diversification, Methods 32(4):416-427). Also a number of companies now synthesize DNA such as Geneart AG, Regensburg, Germany.

The present invention also provides isolated polynucleotides comprising a nucleotide sequence (i) having at least 70% identity to SEQ ID NO:4, or (ii) being capable of hybridizing to a probe derived from the nucleotide sequence set forth in SEQ ID NO:4, under conditions of intermediate to high stringency, or (iii) being complementary to a nucleotide sequence having at least 90% sequence identity to the sequence set forth in SEQ ID NO:4. Probes useful according to the invention may include at least 50, 100, 150, 200, 250, 300 or more contiguous nucleotides of SEQ ID NO:4.

The present invention further provides isolated polynucleotides that encode variant glucoamylases which comprise an amino acid sequence comprising at least 80% amino acid sequence identity to SEQ ID NO:2 or 3. In some embodiments, the variant glucoamylases have at least 80% amino acid sequence identity to SEQ ID NO:2 or 3. In some embodiments, the variant glucoamylases have at least 90% amino acid sequence identity to SEQ ID NO:2. In some embodiments, the variant glucoamylases have at least 93% amino acid sequence identity to SEQ ID NO:2. In some embodiments, the variant glucoamylases have at least 95% amino acid sequence identity to SEQ ID NO:2. In some embodiments, the variant glucoamylases have at least 97% amino acid sequence identity to SEQ ID NO:2. In some embodiments, the variant glucoamylases have at least 98% amino acid sequence identity to SEQ ID NO:2. In some embodiments, the variant glucoamylases have at least 99% amino acid sequence identity to SEQ ID NO:2. The present invention also provides expression vectors comprising any of the polynucleotides provided above.

The present invention also provides fragments (i.e., portions) of the DNA encoding the variant glucoamylases provided herein. These fragments find use in obtaining partial length DNA fragments capable of being used to isolate or identify polynucleotides encoding mature glucoamylase enzymes described herein from filamentous fungal cells (e.g., *Trichoderma, Aspergillus, Fusarium, Penicillium, Schizosaccharomyces*, and *Humicola*), or a segment thereof having glucoamylase activity. In some embodiments, fragments of the DNA may comprise at least 50, 100, 150, 200, 250 300 or more contiguous nucleotides. In some embodiments, portions of the DNA provided in SEQ ID NO:4 find use in obtaining parent glucoamylase and particularly *Trichoderma* glucoamylase homologues from other species, such as filamentous fungi which encode a glucoamylase.

DNA Constructs and Vectors:

According to one embodiment of the invention, a DNA construct comprising a polynucleotide as described above encoding a variant glucoamylase encompassed by the invention and operably linked to a promoter sequence is assembled to transfer into a host cell.

The DNA construct may be introduced into a host cell using a vector. The vector may be any vector which when introduced into a host cell is preferably integrated into the host cell genome and is replicated. Vectors include cloning vectors, expression vectors, shuttle vectors, plasmids, phage particles, cassettes and the like. In some preferred embodiments, the vector is an expression vector that comprises regulatory sequences operably linked to the glucoamylase coding sequence.

Examples of suitable expression and/or integration vectors are provided in Sambrook et al., (1989) supra, and Ausubel (1987) supra, and van den Hondel et al. (1991) in Bennett and Lasure (Eds.) More Gene Manipulations in Fungi, Academic Press pp. 396-428 and U.S. Pat. No. 5,874,276. Reference is also made to the Fungal Genetics Stock Center Catalogue of Strains (FGSC, <www.fgsc.net>) for a list of vectors. Particularly useful vectors include vectors obtained from for example Invitrogen and Promega.

Specific vectors suitable for use in fungal host cells include vectors such as pFB6, pBR322, pUC18, pUC100, pDONR™201, pDONR™221, pENTR™, pGEM®3Z and pGEM®4Z. A general purpose expression vector useful in *Aspergillus* includes pRAX with a glaA promoter, and in *Hypocrea/Trichoderma* includes pTrex3g with a cbh1 promoter.

Suitable plasmids for use in bacterial cells include pBR322 and pUC19 permitting replication in *E. coli* and pE194 for example permitting replication in *Bacillus*.

In some preferred embodiments, the promoter shows transcriptional activity in a bacterial or a fungal host cell and may be derived from genes encoding proteins either homologous or heterologous to the host cell. The promoter may be a mutant, a truncated and/or a hybrid promoter. The above-mentioned promoters are known in the art.

Examples of suitable promoters useful in fungal cells and particularly filamentous fungal cells such as *Trichoderma* or *Aspergillus* cells include such exemplary promoters as the *T. reesei* promoters cbh1, cbh2, egl1, egl2, eg5, xln1 and xln2. Other examples of useful promoters include promoters from *A. awamori* and *A. niger* glucoamylase genes (glaA) (See, Nunberg et al., (1984) *Mol. Cell Biol.* 4:2306-2315 and Boel et al., (1984) *EMBO J.* 3:1581-1585), *A. oryzae* TAKA amylase promoter, the TPI (triose phosphate isomerase) promoter from *S. cerevisiae*, the promoter from *Aspergillus nidulans* acetamidase genes and *Rhizomucor miehei* lipase genes.

Examples of suitable promoters useful in bacterial cells include those obtained from the *E. coli* lac operon; *Bacillus licheniformis* alpha amylase gene (amyL), *B. stearothermophilus* amylase gene (amyM); *Bacillus subtilis* xylA and xylB genes, the beta-lactamase gene, and the tac promoter.

In one embodiment, the promoter is one that is native to the host cell. For example, when *T. reesei* is the host, the promoter is a native *T. reesei* promoter. In another embodiment, the promoter is one that is heterologous to the fungal host cell. In some embodiments the promoter will be the parent glucoamylase promoter such as the TrGA promoter.

In some embodiments, the DNA construct includes nucleic acids coding for a signal sequence that is an amino acid sequence linked to the amino terminus of the polypeptide which directs the encoded polypeptide into the cell's secretory pathway. The 5' end of the coding sequence of the nucleic acid sequence may naturally include a signal peptide coding region which is naturally linked in translation reading frame with the segment of the glucoamylase coding sequence which encodes the secreted glucoamylase or the 5' end of the coding sequence of the nucleic acid sequence may include a signal peptide which is foreign to the coding sequence. In some embodiments, the DNA construct includes a signal sequence that is naturally associated with a parent glucoamylase gene from which a variant glucoamylase has been obtained. In some embodiments the signal sequence will be the sequence depicted in SEQ ID NO:1 or a sequence having at least 90%, at least 94% and at least 98% sequence identity thereto. Effective signal sequences may include the signal sequences obtained from glucoamylases of other filamentous fungal enzymes, such as from *Trichoderma* (*T. reesei* glucoamylase), *Humicola* (*H. insolens* cellulase or *H. grisea* glucoamylase), *Aspergillus* (*A. niger* glucoamylase and *A. oryzae* TAKA amylase), and *Rhizopus*.

In additional embodiments, a DNA construct or vector comprising a signal sequence and a promoter sequence to be introduced into a host cell are derived from the same source. In some embodiments, the native glucoamylase signal sequence of a *Trichoderma* glucoamylase homologue, such as a signal sequence from a *Hypocrea* strain may be used.

In some embodiments, the expression vector also includes a termination sequence. Any terminator sequence functional in the host cell may be used in the present invention. In one embodiment, the termination sequence and the promoter sequence are derived from the same source. In another embodiment, the termination sequence is homologous to the host cell. Useful terminator sequence include terminator sequences obtained from the genes of *Trichoderma reesei* cbh1; *A. niger* or *A. awamori* glucoamylase (Nunberg et al. (1984) supra, and Boel et al., (1984) supra), *Aspergillus nidulans* anthranilate synthase, *Aspergillus oryzae* TAKA amylase, or *A. nidulans* trpC (Punt et al., (1987) *Gene* 56:117-124).

In some embodiments, an expression vector includes a selectable marker. Examples of preferred selectable markers include ones which confer antimicrobial resistance (e.g., hygromycin and phleomycin). Nutritional selective markers also find use in the present invention including those markers known in the art as amdS (acetamidase), argB (ornithine carbamoyltransferase) and pyrG (orotidine-5'phosphate decarboxylase). Markers useful in vector systems for transformation of *Trichoderma* are known in the art (See, e.g., Finkelstein, chapter 6 in Biotechnology of Filamentous

FUNGI, Finkelstein et al. Eds. Butterworth-Heinemann, Boston, Mass. (1992); Kinghorn et al. (1992) APPLIED MOLECULAR GENETICS OF FILAMENTOUS FUNGI, Blackie Academic and Professional, Chapman and Hall, London; Berges and Barreau (1991) Curr. Genet. 19:359-365; and van Hartingsveldt et al., (1987) Mol. Gen. Genet. 206:71-75). In a preferred embodiment, the selective marker is the amdS gene, which encodes the enzyme acetamidase, allowing transformed cells to grow on acetamide as a nitrogen source. The use of *A. nidulans* amdS gene as a selective marker is described in Kelley et al., (1985) *EMBO J.* 4:475-479 and Penttilä et al., (1987) *Gene* 61:155-164.

Methods used to ligate the DNA construct comprising a nucleic acid sequence encoding a variant glucoamylase, a promoter, a terminator and other sequences and to insert them into a suitable vector are well known in the art. Linking is generally accomplished by ligation at convenient restriction sites. If such sites do not exist, synthetic oligonucleotide linkers are used in accordance with conventional practice. (See, Sambrook (1989) supra, and Bennett and Lasure, MORE GENE MANIPULATIONS IN FUNGI, Academic Press, San Diego (1991) pp 70-76.). Additionally, vectors can be constructed using known recombination techniques (e.g., Invitrogen Life Technologies, Gateway Technology).

Host Cells:

The present invention also relates to host cells comprising a polynucleotide encoding a variant glucoamylase of the invention, which are used to produce the glucoamylases of the invention. In some preferred embodiments, the host cells are selected from bacterial, fungal, plant and yeast cells. The term host cell includes both the cells, progeny of the cells and protoplasts created from the cells which are used to produce a variant glucoamylase according to the invention.

In some embodiments, the host cells are fungal cells and preferably filamentous fungal host cells. The term "filamentous fungi" refers to all filamentous forms of the subdivision Eumycotina (See, Alexopoulos, C. J. (1962), INTRODUCTORY MYCOLOGY, Wiley, New York). These fungi are characterized by a vegetative mycelium with a cell wall composed of chitin, cellulose, and other complex polysaccharides. The filamentous fungi of the present invention are morphologically, physiologically, and genetically distinct from yeasts. Vegetative growth by filamentous fungi is by hyphal elongation and carbon catabolism is obligatory aerobic. In the present invention, the filamentous fungal parent cell may be a cell of a species of, but not limited to, *Trichoderma*, (e.g., *Trichoderma reesei*, the asexual morph of *Hypocrea jecorina*, previously classified as *T. longibrachiatum, Trichoderma viride, Trichoderma koningii, Trichoderma harzianum*) (Sheir-Neirs et al., (1984) Appl. Microbiol. Biotechnol 20:46-53; ATCC No. 56765 and ATCC No. 26921); *Penicillium* sp., *Humicola* sp. (e.g., *H. insolens, H. lanuginosa* and *H. grisea*); *Chrysosporium* sp. (e.g., *C. lucknowense*), *Gliocladium* sp., *Aspergillus* sp. (e.g., *A. oryzae, A. niger, A sojae, A. japonicus, A. nidulans*, and *A. awamori*) (Ward et al., (1993) Appl. Microbiol. Biotechnol. 39:738-743 and Goedegebuur et al., (2002) Genet 41:89-98), *Fusarium* sp., (e.g. *F. roseum, F. graminum F. cerealis, F. oxysporuim* and *F. venenatum*), *Neurospora* sp., (*N. crassa*), *Hypocrea* sp., *Mucor* sp., (*M. miehei*), *Rhizopus* sp. and *Emericella* sp. (See also, Innis et al., (1985) *Sci.* 228:21-26). The term "*Trichoderma*" or "*Trichoderma* sp." or "*Trichoderma* spp." refer to any fungal genus previously or currently classified as *Trichoderma*.

In some embodiments, the host cells will be gram-positive bacterial cells. Non-limiting examples include strains of *Streptomyces*, (e.g., *S. lividans, S. coelicolor* and *S. griseus*) and *Bacillus*. As used herein, "the genus *Bacillus*" includes all species within the genus "*Bacillus*," as known to those of skill in the art, including but not limited to *B. subtilis, B. licheniformis, B. lentus, B. brevis, B. stearothermophilus, B. alkalophilus, B. amyloliquefaciens, B. clausii, B. halodurans, B. megaterium, B. coagulans, B. circulans, B. lautus*, and *B. thuringiensis*. It is recognized that the genus *Bacillus* continues to undergo taxonomical reorganization. Thus, it is intended that the genus include species that have been reclassified, including but not limited to such organisms as *B. stearothermophilus*, which is now named "*Geobacillus stearothermophilus.*"

In some embodiments the host cell is a gram-negative bacterial strain, such as *E. coli* or *Pseudomonas* sp. In other embodiments, the host cells may be yeast cells such as *Saccharomyces* sp., *Schizosaccharomyces* sp., *Pichia* sp., or *Candida* sp.

In other embodiments, the host cell will be a genetically engineered host cell wherein native genes have been inactivated, for example by deletion in bacterial or fungal cells. Where it is desired to obtain a fungal host cell having one or more inactivated genes known methods may be used (e.g. methods disclosed in U.S. Pat. No. 5,246,853, U.S. Pat. No. 5,475,101 and WO 92/06209). Gene inactivation may be accomplished by complete or partial deletion, by insertional inactivation or by any other means which renders a gene nonfunctional for its intended purpose (such that the gene is prevented from expression of a functional protein). In some preferred embodiments, when the host cell is a *Trichoderma* cell and particularly a *T. reesei* host cell, the cbh1, cbh2, egl1 and egl2 genes will be inactivated and preferably deleted. Particularly preferred *Trichoderma reesei* host cells having quad-deleted proteins are set forth and described in U.S. Pat. No. 5,847,276 and WO 05/001036. In other embodiments, the host cell is a protease deficient or protease minus strain.

Transformation of Host Cells:

Introduction of a DNA construct or vector into a host cell includes techniques such as transformation; electroporation; nuclear microinjection; transduction; transfection, (e.g., lipofection mediated and DEAE-Dextrin mediated transfection); incubation with calcium phosphate DNA precipitate; high velocity bombardment with DNA-coated microprojectiles; and protoplast fusion. General transformation techniques are known in the art (See, e.g., Ausubel et al., (1987), supra, chapter 9; and Sambrook (1989) supra, and Campbell et al., (1989) *Curr. Genet.* 16:53-56).

Transformation methods for *Bacillus* are disclosed in numerous references including Anagnostopoulos C and J. Spizizen (1961) J. Bacteriol. 81:741-746 and WO 02/14490.

Transformation methods for *Aspergillus* are described in Yelton et al (1984) Proc. Natl. Acad. Sci. USA 81:1470-1474; Berka et al., (1991) in Applications of Enzyme Biotechnology, Eds. Kelly and Baldwin, Plenum Press (NY); Cao et al., (2000) *Sci.* 9:991-1001; Campbell et al., (1989) *Curr. Genet.* 16:53-56 and EP 238 023. The expression of heterologous protein in *Trichoderma* is described in U.S. Pat. No. 6,022,725; U.S. Pat. No. 6,268,328; Harkki et al. (1991); *Enzyme Microb. Technol.* 13:227-233; Harkki et al., (1989) *Bio Technol.* 7:596-603; EP 244,234; EP 215,594; and Nevalainen et al., "*The Molecular Biology of Trichoderma and its Application to the Expression of Both Homologous and Heterologous Genes*", in MOLECULAR INDUSTRIAL MYCOLOGY, Eds. Leong and Berka, Marcel Dekker Inc., NY (1992) pp. 129-148). Reference is also made to WO96/00787 and Bajar et al., (1991) Proc. Natl. Acad. Sci. USA 88:8202-28212 for transformation of *Fusarium* strains.

In one specific embodiment, the preparation of *Trichoderma* sp. for transformation involves the preparation of protoplasts from fungal mycelia (See, Campbell et al., (1989) *Curr. Genet.* 16:53-56; Pentilla et al., (1987) *Gene* 61:155-164). *Agrobacterium tumefaciens*-mediated transformation of filamentous fungi is known (See, de Groot et al., (1998) *Nat. Biotechnol.* 16:839-842). Reference is also made to U.S. Pat. No. 6,022,725 and U.S. Pat. No. 6,268,328 for transformation procedures used with filamentous fungal hosts.

Preferably, genetically stable transformants are constructed with vector systems whereby the nucleic acid encoding the variant glucoamylase is stably integrated into a host strain chromosome. Transformants are then purified by known techniques.

In some further embodiments, the host cells are plant cells, such as cells from a monocot plant (e.g. corn, wheat and sorghum) or cells from a dicot plant (e.g. soybean). Methods for making DNA constructs useful in transformation of plants and methods for plant transformation are known. Some of these methods include *Agrobacterium tumefaciens* mediate gene transfer; microprojectile bombardment, PEG mediated transformation of protoplasts, electroporation and the like. Reference is made to (U.S. Pat. No. 6,803,499, U.S. Pat. No. 6,777,589; Fromm et al (1990) *Biotechnol.* 8:833-839; Potrykus et al (1985) *Mol. Gen. Genet.* 199:169-177.

Production of Proteins:

The present invention further relates to methods of producing the variant glucoamylases comprising transforming a host cell with an expression vector comprising a polynucleotide encoding a variant glucoamylase according to the invention, optionally culturing the host cell under conditions suitable for production of the variant glucoamylase and optionally recovering the glucoamylase.

In the expression and production methods of the present invention the host cells are cultured under suitable conditions in shake flask cultivation, small scale or large scale fermentations (including continuous, batch and fed batch fermentations) in laboratory or industrial fermentors, with suitable medium containing physiological salts and nutrients (See, e.g., Pourquie, J. et al., BIOCHEMISTRY AND GENETICS OF CELLULOSE DEGRADATION, eds. Aubert, J. P. et al., Academic Press, pp. 71-86, 1988 and Ilmen, M. et al., (1997) *Appl. Environ. Microbiol.* 63:1298-1306). Common commercially prepared media (e.g., Yeast Malt Extract (YM) broth, Luria Bertani (LB) broth and Sabouraud Dextrose (SD) broth) find use in the present invention. Preferred culture conditions for bacterial and filamentous fungal cells are known in the art and may be found in the scientific literature and/or from the source of the fungi such as the American Type Culture Collection and Fungal Genetics Stock Center. In cases where a glucoamylase coding sequence is under the control of an inducible promoter, the inducing agent (e.g., a sugar, metal salt or antimicrobial), is added to the medium at a concentration effective to induce glucoamylase expression.

In some embodiments, the present invention relates to methods of producing the variant glucoamylase comprising cultivating a plant or plant cell comprising a polynucleotide encoding a variant glucoamylase according to the invention under conditions suitable for the production of the variant and optionally recovering the glucoamylase.

In some embodiments, in order to evaluate the expression of a variant glucoamylase by a cell line that has been transformed with a polynucleotide encoding a variant glucoamylase encompassed by the invention, assays are carried out at the protein level, the RNA level and/or by use of functional bioassays particular to glucoamylase activity and/or production. Some of these assays include Northern blotting, dot blotting (DNA or RNA analysis), RT-PCR (reverse transcriptase polymerase chain reaction), or in situ hybridization, using an appropriately labeled probe (based on the nucleic acid coding sequence) and conventional Southern blotting and autoradiography.

In addition, the production and/or expression of a variant glucoamylase may be measured in a sample directly, for example, by assays directly measuring reducing sugars such as glucose in the culture medium and by assays for measuring glucoamylase activity, expression and/or production. In particular, glucoamylase activity may be assayed by the 3,5-dinitrosalicylic acid (DNS) method (See, Goto et al., (1994) Biosci. Biotechnol. Biochem. 58:49-54). In additional embodiments, protein expression, is evaluated by immunological methods, such as immunohistochemical staining of cells, tissue sections or immunoassay of tissue culture medium, (e.g., by Western blot or ELISA). Such immunoassays can be used to qualitatively and quantitatively evaluate expression of a glucoamylase. The details of such methods are known to those of skill in the art and many reagents for practicing such methods are commercially available.

The glucoamylases of the present invention may be recovered or purified from culture media by a variety of procedures known in the art including centrifugation, filtration, extraction, precipitation and the like.

Compositions:

The variant glucoamylases may be used in enzyme compositions including but not limited to starch hydrolyzing and saccharifying compositions, cleaning and detergent compositions (e.g., laundry detergents, dish washing detergents, and hard surface cleaning compositions), alcohol fermentation compositions, and in animal feed compositions. Further the variant glucoamylases may be used in baking applications, such as bread and cake production, brewing, healthcare, textile, environmental waste conversion processes, biopulp processing, and biomass conversion applications.

In some embodiments, an enzyme composition including a variant glucoamylase encompassed by the invention obtained in culture media or recovered and purified from the culture medium will be optionally used in combination with any one or combination of the following enzymes—alpha amylases, proteases, pullulanases, isoamylases, cellulases, hemicellulases, xylanases, cyclodextrin glycotransferases, lipases, phytases, laccases, oxidases, esterases, cutinases, xylanases, granular starch hydrolyzing enzyme and other glucoamylases. In one embodiment, the proteases are acid fungal proteases (AFP). In a further embodiment, the acid fungal proteases are from *Trichoderma* (e.g., NSP-24, see also US 2006/015342, published Jul. 13, 2006, SEQ ID NO:10, incorporated by reference). In a further embodiment, the phytase is from Buttiauxiella.spp. (e.g., BP-17, see also variants disclosed in PCT patent publication WO 2006/043178).

In some particularly preferred compositions the variant glucoamylases of the invention will be combined with an alpha amylase, such as fungal alpha amylases (e.g. *Aspergillus* sp.) or bacterial alpha amylases (e.g. *Bacillus* sp. such as *B. stearothermophilus, B. amyloliquefaciens* and *B. licheniformis*) and variants and hybrids thereof. In one embodiment the alpha amylase is an acid stable alpha amylase. In one embodiment, the alpha amylase is a granular starch hydrolyzing enzyme (GSHE). In one embodiment, the alpha amylase is *Aspergillus* kawachi alpha amylase

(AKAA), see U.S. Pat. No. 7,037,704. Commercially available alpha amylases contemplated for use in the compositions of the invention are known and include GZYME G997, SPEZYME FRED, SPEZYME XTRA, STARGEN (Danisco US, Inc, Genencor Division), TERMAMYL 120-L and SUPRA (Novozymes, Biotech.) and VIRIDIUM (Diversa).

In other preferred embodiments, the variant glucoamylases of the invention may be combined with other glucoamylases. In some embodiments, the glucoamylases of the invention will be combined with one or more glucoamylases derived from strains of *Aspergillus* or variants thereof, such as *A. oryzae, A. niger, A. kawachi*, and *A. awamori*; glucoamylases derived from strains of *Humicola* or variants thereof, particularly *H. grisea*, such as the glucoamylase having at least 90%, 93%, 95%, 96%, 97%, 98% and 99% sequence identity to SEQ ID NO: 3 disclosed in WO 05/052148; glucoamylases derived from strains of *Talaromyces* or variants thereof, particularly *T. emersonii*; glucoamylases derived from strains of *Athelia* and particularly *A. rolfsii*; glucoamylases derived from strains of *Penicillium*, particularly *P. chrysogenum*.

Uses:

In particular, the variant glucoamylases may be used for starch conversion processes, and particularly in the production of dextrose for fructose syrups, specialty sugars and in alcohol and other end-product (e.g. organic acid, ascorbic acid, and amino acids) production from fermentation of starch containing substrates (G.M.A van Beynum et al., Eds. (1985) Starch Conversion Technology, Marcel Dekker Inc. NY). Dextrins produced using variant glucoamylase compositions of the invention may result in glucose yields of at least 80%, at least 85%, at least 90% and at least 95%. Production of alcohol from the fermentation of starch substrates using glucoamylases encompassed by the invention may include the production of fuel alcohol or portable alcohol. In some embodiments, the production of alcohol will be greater when the variant glucoamylase is used under the same conditions as the parent glucoamylase. In some embodiments, the production of alcohol will be between about 0.5% and 2.5% better, including but not limited to 0.6%, 0.7%, 0.8%, 0.9%, 1.0%, 1.1%, 1.2%, 1.3%, 1.4%, 1.5%, 1.6%. 1.7%, 1.8%, 1.9%, 2.0%, 2.1%, 2.2%, 2.3%, and 2.4% more alcohol than the parent glucoamylase.

In one preferred embodiment, the variant glucoamylases of the invention will find use in the hydrolysis of starch from various plant-based substrates, which are used for alcohol production. In some preferred embodiments, the plant-based substrates will include corn, wheat, barley, rye, milo, rice, sugar cane, potatoes and combinations thereof. In some embodiments, the plant-based substrate will be fractionated plant material, for example a cereal grain such as corn, which is fractionated into components such as fiber, germ, protein and starch (endosperm) (U.S. Pat. No. 6,254,914 and U.S. Pat. No. 6,899,910). Methods of alcohol fermentations are described in The Alcohol Textbook, A Reference For The Beverage, Fuel and Industrial Alcohol Industries, 3rd Ed., Eds K. A. Jacques et al., 1999, Nottingham University Press, UK. In certain preferred embodiments, the alcohol will be ethanol. In particular, alcohol fermentation production processes are characterized as wet milling or dry milling processes. In some embodiments, the variant glucoamylase will be used in a wet milling fermentation process and in other embodiments the variant glucoamylase will find use in a dry milling process.

Dry grain milling involves a number of basic steps, which generally include: grinding, cooking, liquefaction, saccharification, fermentation and separation of liquid and solids to produce alcohol and other co-products. Plant material and particularly whole cereal grains, such as corn, wheat or rye are ground. In some cases the grain may be first fractionated into component parts. The ground plant material may be milled to obtain a coarse or fine particle. The ground plant material is mixed with liquid (e.g. water and/or thin stillage) in a slurry tank. The slurry is subjected to high temperatures (e.g. 90° C. to 105° C. or higher) in a jet cooker along with liquefying enzymes (e.g. alpha amylases) to solublize and hydrolyze the starch in the grain to dextrins. The mixture is cooled down and further treated with saccharifying enzymes, such as glucoamylases encompassed by the instant invention, to produce glucose. The mash containing glucose may then be fermented for approximately 24 to 120 hours in the presence of fermentation microorganisms, such as ethanol producing microorganism and particularly yeast (*Saccharomyces* spp). The solids in the mash are separated from the liquid phase and alcohol such as ethanol and useful co-products such as distillers' grains are obtained.

In some embodiments, the saccharification step and fermentation step are combined and the process is referred to as simultaneous saccharification and fermentation or simultaneous saccharification, yeast propagation and fermentation.

In other embodiments, the variant glucoamylase is used in a process for starch hydrolysis wherein the temperature of the process is carried out at a temperature of between 30° C. and 75° C. and also at a temperature of between 40° C. and 65° C. at a pH range of between pH 3.0 and pH 6.5. The fermentation processes in some embodiments include milling of a cereal grain or fractionated grain and combining the ground cereal grain with liquid to form a slurry which is then mixed in a single vessel with a variant glucoamylase according to the invention and optionally other enzymes such as but not limited to alpha amylases, other glucoamylases, phytases, proteases, pullulanases, isoamylases or other enzymes having granular starch hydrolyzing activity and yeast to produce ethanol and other co-products (U.S. Pat. No. 4,514,496, WO 04/081193 and WO 04/080923).

In some embodiments, the invention pertains to a method of saccharifying a liquid starch solution, which comprises an enzymatic saccharification step using a variant glucoamylase of the invention.

The present invention also provides an animal feed comprising at least one variant glucoamylase encompassed by the invention. Methods of using a glucoamylase enzyme in the production of feeds comprising starch are provided in WO 03/049550, filed Dec. 13, 2002 (herein incorporated by reference in its entirety. Briefly, the glucoamylase variant is admixed with a feed comprising starch. The glucoamylase is capable of degrading resistant starch for use by the animal.

Other objects and advantages of the present invention are apparent from the present Specification.

EXPERIMENTAL

In the disclosure and experimental section which follows, the following abbreviations apply: GA (glucoamylase); GAU (glucoamylase unit); wt % (weight percent); ° C. (degrees Centigrade); rpm (revolutions per minute); H_2O (water); dH_2O (deionized water); dIH_2O (deionized water, Milli-Q filtration); aa or AA (amino acid); bp (base pair); kb (kilobase pair); kD (kilodaltons); g or gm (grams); µg (micrograms); mg (milligrams); µL (microliters); ml and mL (milliliters); mm (millimeters); µm (micrometer); M (molar); mM (millimolar); µM (micromolar); U (units); V

(volts); MW (molecular weight); sec(s) or s(s) (second/seconds); min(s) or m(s) (minute/minutes); hr(s) or h(s) (hour/hours); DO (dissolved oxygen); ABS (Absorbance); EtOH (ethanol); PSS (physiological salt solution; m/v (mass/volume); and MTP (microtiter plate); N (Normal); DP1 (monosaccharides); DP2 (disaccharides); DP>3 (oligosaccharides, sugars having a degree of polymerization greater than 3); ppm (parts per million).

The methods used to provide variants are described below. However, it should be noted that different methods may be used to provide variants of a parent molecule and the invention is not limited to the methods used in the examples. It is intended that any suitable means for making variants and selection of variants may be used.

pNPG Glucoamylase Activity Assay for 96-Well Microtiter Plates:

The reagent solutions were: NaAc buffer: 200 mM sodium acetate buffer pH 4.5; Substrate: 50 mM p-nitrophenyl-α-D-glucopyranoside (Sigma N-1377) in NaAc buffer (0.3 g/20 ml) and stop solution: 800 mM glycine-NaOH buffer pH 10. 30 μl filtered supernatant was placed in a fresh 96-well flat bottom MTP. To each well 50 μl NaAc buffer and 120 μl substrate was added and incubated for 30 minutes at 50° C. (Thermolab systems iEMS Incubator/shaker HT). The reaction was terminated by adding 100 μl stop solution. The absorbance was measured at 405 nm in a MTP-reader (Molecular Devices Spectramax 384 plus) and the activity was calculated using a molar extinction coefficient of 0.011 μM/cm.

Thermal Stability Assay:

Crude supernatant (100 μl) was added to 100 μl 50 mM NaAc buffer pH 4.5. the sample was equally divided over 2 MTP. One MTP (initial plate) was incubated for 1 hr at 4° C. and the other MTP (residual plate) was incubated at 60° C. (Thermolab systems iEMS Incubator/Shaker HT) for 1 hr. The residual plate was chilled for 15 min on ice. Activity is measured on both plates using the ethanol application assay described below, with the following modification: the amount of sample taken for the thermostability assay is 25 μl and the amount of 30 mM NaAc buffer pH 4.0 is 350.

Thermostability is calculated as % residual activity as follows:

$$\frac{\text{ABS (340) residual} - \text{blank}}{\text{ABS (340) initial} - \text{blank}} \times 100\%.$$

The crude supernatant material is tested for remaining glucose in the culture medium after the growth period. If remaining glucose is found, the absorbance value is subtracted from the measured absorbance values of both the initial activity as the residual activity.

Bradford Assay for Protein Quantification in 96-Well Microtiter Plates:

The reagent solution was Bradford Quickstart work solution (BioRad cat#500-0205). 100 μl of 10 kD-filtered supernatant was placed in a fresh 96-well flat bottom plate. To each well 200 μl reagent was added and incubated for 5 minutes at room temperature. The absorbance was measured at 595 nm in a MTP-reader (Molecular Devices Spectramax 384 plus). Protein concentrations were calculated according to a Bovine Serum Albumin (BSA) (0-50 μg/ml) standard curve.

Hexokinase Activity Assay:

Hexokinase cocktail: 10-15 minutes prior to use, 90 ml water was added to a BoatlL container glucose HK R1 (IL test glucose (HK) kit, Instrument Laboratory #182507-40) and gently mixed. 85 μl of Hexokinase cocktail was added to 100 μl of dH_2O. 150 of sample was added to the mixtures and incubated for 5 mins in the dark at room temperature. Absorbance was read at 340 nm in a MTP-reader. Glucose concentrations were calculated according to a glucose (0-1 mg/ml) standard curve.

Assay Conditions Ethanol Application:

8% stock solution: 8 g of soluble corn starch (Sigma #S4180) was suspended in 40 ml dH_2O at room temperature. 50 ml of boiling dH_2O was added to the slurry in a 250 ml flask and cooked for 5 mins. The starch solution was cooled to 25° C. and the volume adjusted to 100 ml with dH_2O.

Stop Solution: 800 mM Glycine-NaOH Buffer, pH 10.0.

4% (m/v) soluble starch working solution: stock solution was diluted (1:1) with 100 mM sodium acetate buffer pH 4.0.

50 μl 30 mM NaAc buffer pH 4.0 was placed in a fresh 96-well flat bottom plate. To each well 120 μl 4% soluble corn starch and 100 10 kD-filtered supernatant was added and incubated for 2 hrs at 32° C. 900 rpm (Thermolabsystems iEMS Incubator/Shaker HT). The reaction was stopped by adding 90 μl 4° C.-cold Stop Solution. The sample was placed on ice. Starch was spun down at 716×g at 15° C. for 5 mins (SIGMA 6K15) and 15 μl supernatant was used in the Hexokinase activity assay described above to determine the glucose content.

Assay Conditions Sweetener Application:

8% stock solution: 8 g of soluble starch (Sigma #S4180) was suspended in 40 ml water at room temperature. 50 ml of boiling dH_2O was added to the slurry in a 250 ml flask and cooked for 5 mins. The starch solution was cooled to 25° C. and the volume adjusted to 100 ml with dH_2O.

Stop solution: 800 mM Glycine-NaOH buffer, pH 10.0.

4% (m/v) soluble starch working solution: stock solution was diluted (1:1) with 100 mM sodium acetate buffer pH 4.5.

50 μl 80 mM NaAc buffer pH 4.5 was placed in a fresh 96-well flat bottom plate. To each well 120 μl 4% soluble cornstarch and 5 μl 10 kD-filtered supernatant was added and incubated for 1 hr at 60° C. The reaction was stopped by adding 90 μl 4° C. cold Stop Solution. The sample was placed on ice for 30 mins. Starch was spun down at 716 rpm at 15° C. for 5 minutes (Sigma 6K15, centrifuge) and 15 μl of the supernatant was used in the Hexokinase activity assay described herein to determine glucose content.

EXAMPLES

The following examples are provided in order to demonstrate and further illustrate certain preferred embodiments and aspect of the present invention and are not to be construed as limiting the scope thereof.

Example 1

Construction of the pREP3Y-TrGA Vector

The TrGA expression cassette composed of the DNA sequence (SEQ ID NO: 4) encoding the TrGA signal peptide, the pro-sequence, and the mature protein, including the catalytic domain, linker region and starch binding domain, was cloned into pDONR™201, a Gateway® Entry vector (Invitrogen, Carlsbad, Calif., USA). The TrGA expression cassette was cloned into the Gateway compatible destination vector pREP3Y-DEST (FIG. **3**) by the Gateway® LR recombination reaction.

The pRep3Y-TrGA expression vector (FIG. **3**B) enabled the expression of the TrGA protein (SEQ ID NO:2) in *Schizosaccharomyces pombe*.

Sixty-five TrGA site saturated mutagenesis (SSM) libraries were constructed using the pDONR-TrGA entry vector (FIG. **2**) as a template and the primers listed in Table 2. The mutagenesis primers used in the experiments all contain the triple DNA sequence code NNS (N=A,C,T,G and S=C or G) at the position that corresponds with the codon of the TrGA sequence to be mutated (SEQ ID NO:2) and initiated random incorporation of nucleotides at that position. Construction of each SSM library started with two PCR amplifications using the Gateway forward (pDONR201—FW) and a specific reverse mutagenesis primer (Table 3), and Gateway reversed (pDONR201—RV) primer and a specific forward mutagenesis primer (Table 2) (equal positions for the mutagenesis primers). Phusion high fidelity DNA polymerase (Finnzymes OY, Espoo, Finland) was used for PCR amplification (0.204 primers, 25 cycles) according to the protocol provided by Finnzymes. Briefly, 1 μl (SEQ ID NO:1), DNA fragment of both specific PCR mixes, both targeted at the same codon were added to 48 μl of fresh PCR reaction solution together with primers Gateway FW and Gateway RV (Invitrogen) and mixed. This fusion PCR amplification (22 cycles) resulted in a linear expression cassette DNA fragment with a specific TrGA codon randomly mutated and unique Gateway recombination sites on both ends. Purification of this DNA fragment (ChargeSwitch® PCR clean-up, Invitrogen, Carlsbad USA) and a BP recombination reaction (Invitrogen, Carlsbad, USA) with pDONR201 (Invitrogen) generated a circular multimeric DNA (entry vector) that was subsequently transformed to *E. coli* Max efficiency DH5α, (Invitrogen) and plated on 2×TY medium [Bacto Tryptone (Difco) 16 g/L, Bacto Yeast Extract (Difco) 10 g/L, NaCL 5 g/L] supplemented with 50 μg/mL kanamycin.

TABLE 2

Forward primers used to generate TrGA SSM Libraries

Primers	DNA SEQUENCE 5' TO 3'	SEQ ID NO:
pDON R201-FW	TCGCGTTAACGCTAGCATGGATCTC	10
D4F	TCTGTTGAC**NNS**TTCATCAGCACCGAGACGC	11
F5F	TCTGTTGACGAC**NNS**ATCAGCACCGAGACGCCTA	12
I12F	ATCAGCACCGAGACGCCT**NNS**GCACTGAACAATCTTCTTT	13
D24F	CTTTGCAATGTTGGTCCT**NNS**GGATGCCGTGCATTCGGCA	14
F29F	CCTGATGGATGCCGTGCA**NNS**GGCACATCAGCTGGTGCGG	15
I43F	ATTGCATCTCCCAGCACA**NNS**GACCCGGACTACTATTACA	16
D44F	GCATCTCCCAGCACAATT**NNS**CCGGACTACTATTACATGT	17
P45F	TCTCCCAGCACAATTGAC**NNS**GACTACTATTACATGTGGA	18
D46F	CCCAGCACAATTGACCCG**NNS**TACTATTACATGTGGACGC	19
Y47F	AGCACAATTGACCCGGAC**NNS**TATTACATGTGGACGCGAG	20
Y49F	ATTGACCCGGACTACTAT**NNS**ATGTGGACGCGAGATAGCG	21
W51F	CCGGACTACTATTACATG**NNS**ACGCGAGATAGCGCTCTTG	22
Y70F	GACCGCTTCACCGAAACG**NNS**GATGCGGGCCTGCAGCGCC	23
Q75F	ACGTACGATGCGGGCCTG**NNS**CGCCGCATCGAGCAGTACA	24
R76F	TACGATGCGGGCCTGCAG**NNS**CGCATCGAGCAGTACATTA	25
P94F	CTCCAGGGCCTCTCTAAC**NNS**TCGGGCTCCCTCGCGGACG	26
D100F	CCCTCGGGCTCCCTCGCG**NNS**GGCTCTGGTCTCGGCGAGC	27
K114F	AAGTTTGAGTTGACCCTG**NNS**CCTTTCACCGGCAACTGGG	28
F116F	GAGTTGACCCTGAAGCCT**NNS**ACCGGCAACTGGGGTCGAC	29
N119F	CTGAAGCCTTTCACCGGC**NNS**TGGGGTCGACCGCAGCGGG	30
R122F	TTCACCGGCAACTGGGGT**NNS**CCGCAGCGGGATGGCCCAG	31
R125F	AACTGGGGTCGACCGCAG**NNS**GATGGCCCAGCTCTGCGAG	32
N146F	AAGTGGCTCATCAACAAC**NNS**TATCAGTCGACTGTGTCCA	33
Q148F	CTCATCAACAACAACTAT**NNS**TCGACTGTGTCCAACGTCA	34
Y169F	CTCAACTATGTTGCCCAG**NNS**TGGAACCAAACCGGCTTTG	35

TABLE 2-continued

Forward primers used to generate TrGA SSM Libraries

Primers	DNA SEQUENCE 5' TO 3'	SEQ ID NO:
Q172F	GTTGCCCAGTACTGGAAC**NNS**ACCGGCTTTGACCTCTGGG	36
F175F	TACTGGAACCAAACCGGC**NNS**GACCTCTGGGAAGAAGTCA	37
W178F	CAAACCGGCTTTGACCTC**NNS**GAAGAAGTCAATGGGAGCT	38
E180F	GGCTTTGACCTCTGGGAA**NNS**GTCAATGGGAGCTCATTCT	39
V181F	TTTGACCTCTGGGAAGAA**NNS**AATGGGAGCTCATTCTTTA	40
Q208F	CTTGCTGCCACTCTTGGC**NNS**TCGGGAAGCGCTTATTCAT	41
S211F	ACTCTTGGCCAGTCGGGA**NNS**GCTTATTCATCTGTTGCTC	42
W228F	TGCTTTCTCCAACGATTC**NNS**GTGTCGTCTGGTGGATACG	43
N242F	GACTCCAACATCAACACC**NNS**GAGGGCAGGACTGGCAAGG	44
E243F	TCCAACATCAACACCAAC**NNS**GGCAGGACTGGCAAGGATG	45
R245F	ATCAACACCAACGAGGGC**NNS**ACTGGCAAGGATGTCAACT	46
I292F	GTCGACTCCTTCCGCTCC**NNS**TACGGCGTGAACAAGGGCA	47
G294F	TCCTTCCGCTCCATCTAC**NNS**GTGAACAAGGGCATTCCTG	48
K297F	TCCATCTACGGCGTGAAC**NNS**GGCATTCCTGCCGGTGCTG	49
R309F	GCTGCCGTCGCCATTGGC**NNS**TATGCAGAGGATGTGTACT	50
Y310F	GCCGTCGCCATTGGCCGG**NNS**GCAGAGGATGTGTACTACA	51
D313F	ATTGGCCGGTATGCAGAG**NNS**GTGTACTACAACGGCAACC	52
V314F	GGCCGGTATGCAGAGGAT**NNS**TACTACAACGGCAACCCTT	53
Y315F	CGGTATGCAGAGGATGTG**NNS**TACAACGGCAACCCTTGGT	54
Y316F	TATGCAGAGGATGTGTAC**NNS**AACGGCAACCCTTGGTATC	55
N317F	GCAGAGGATGTGTACTAC**NNS**GGCAACCCTTGGTATCTTG	56
W321F	TACTACAACGGCAACCCT**NNS**TATCTTGCTACATTTGCTG	57
K340F	GATGCCATCTACGTCTGG**NNS**AAGACGGGCTCCATCACGG	58
K341F	GCCATCTACGTCTGGAAG**NNS**ACGGGCTCCATCACGGTGA	59
T350F	TCCATCACGGTGACCGCC**NNS**TCCCTGGCCTTCTTCCAGG	60
Q356F	ACCTCCCTGGCCTTCTTC**NNS**GAGCTTGTTCCTGGCGTGA	61
T363F	GAGCTTGTTCCTGGCGTG**NNS**GCCGGGACCTACTCCAGCA	62
S368F	GTGACGGCCGGGACCTAC**NNS**AGCAGCTCTTCGACCTTTA	63
S369F	ACGGCCGGGACCTACTCC**NNS**AGCTCTTCGACCTTTACCA	64
N376F	AGCTCTTCGACCTTTACC**NNS**ATCATCAACGCCGTCTCGA	65
Y395F	CTCAGCGAGGCTGCCAAG**NNS**GTCCCCGCCGACGGTTCGC	66
A398F	GCTGCCAAGTACGTCCCC**NNS**GACGGTTCGCTGGCCGAGC	67
S401F	TACGTCCCCGCCGACGGT**NNS**CTGGCCGAGCAGTTTGACC	68
R408F	CTGGCCGAGCAGTTTGAC**NNS**AACAGCGGCACTCCGCTGT	69
N409F	GCCGAGCAGTTTGACCGC**NNS**AGCGGCACTCCGCTGTCTG	70
T412F	TTTGACCGCAACAGCGGC**NNS**CCGCTGTCTGCGCTTCACC	71
H418F	ACTCCGCTGTCTGCGCTT**NNS**CTGACGTGGTCGTACGCCT	72
W421F	TCTGCGCTTCACCTGACG**NNS**TCGTACGCCTCGTTCTTGA	73

TABLE 2-continued

Forward primers used to generate TrGA SSM Libraries

Primers	DNA SEQUENCE 5' TO 3'	SEQ ID NO:
R433F	TTGACAGCCACGGCCCGT**NNS**GCTGGCATCGTGCCCCCCT	74
I436F	ACGGCCCGTCGGGCTGGC**NNS**GTGCCCCCCTCGTGGGCCA	75
S451F	AGCGCTAGCACGATCCCC**NNS**ACGTGCTCCGGCGCGTCCG	76

TABLE 3

Primers used to Generate TrGA SSM Libraries

Primer	DNA sequence 5' to 3'	SEQ ID NO:
pDON201-RV	GTAACATCAGAGATTTTGAGACAC	77
D4R	GCGTCTCGGTGCTGATGAASNNGTCAACAGA	78
F5R	TAGGCGTCTCGGTGCTGATSNNGTCGTCAACAGA	79
I12R	AAAGAAGATTGTTCAGTGCSNNAGGCGTCTCGGTGCTGAT	80
D24R	TGCCGAATGCACGGCATCCSNNAGGACCAACATTGCAAAG	81
F29R	CCGCACCAGCTGATGTGCCSNNTGCACGGCATCCATCAGG	82
I43R	TGTAATAGTAGTCCGGGTCSNNTGTGCTGGGAGATGCAAT	83
D44R	ACATGTAATAGTAGTCCGGSNNAATTGTGCTGGGAGATGC	84
P45R	TCCACATGTAATAGTAGTCSNNGTCAATTGTGCTGGGAGA	85
D46R	GCGTCCACATGTAATAGTASNNCGGGTCAATTGTGCTGGG	86
Y47R	CTCGCGTCCACATGTAATASNNGTCCGGGTCAATTGTGCT	87
Y49R	CGCTATCTCGCGTCCACATSNNATAGTAGTCCGGGTCAAT	88
W51R	CAAGAGCGCTATCTCGCGTSNNCATGTAATAGTAGTCCGG	89
Y70R	GGCGCTGCAGGCCCGCATCSNNCGTTTCGGTGAAGCGGTC	90
Q75R	TGTACTGCTCGATGCGGCGSNNCAGGCCCGCATCGTACGT	91
R76R	TAATGTACTGCTCGATGCGSNNCTGCAGGCCCGCATCGTA	92
P94R	CGTCCGCGAGGGAGCCCGASNNGTTAGAGAGGCCCTGGAG	93
D100R	GCTCGCCGAGACCAGAGCCSNNCGCGAGGGAGCCCGAGGG	94
K114R	CCCAGTTGCCGGTGAAAGGSNNCAGGGTCAACTCAAACTT	95
F116R	GTCGACCCCAGTTGCCGGTSNNAGGCTTCAGGGTCAACTC	96
N119R	CCCGCTGCGGTCGACCCCASNNGCCGGTGAAAGGCTTCAG	97
R122R	CTGGGCCATCCCGCTGCGGSNNACCCCAGTTGCCGGTGAA	98
R125R	CTCGCAGAGCTGGGCCATCSNNCTGCGGTCGACCCCAGTT	99
N146R	TGGACACAGTCGACTGATASNNGTTGTTGATGAGCCACTT	100
Q148R	TGACGTTGGACACAGTCGASNNATAGTTGTTGTTGATGAG	101
Y169R	CAAAGCCGGTTTGGTTCCASNNCTGGGCAACATAGTTGAG	102
Q172R	CCCAGAGGTCAAAGCCGGTSNNGTTCCAGTACTGGGCAAC	103
F175R	TGACTTCTTCCCAGAGGTCSNNGCCGGTTTGGTTCCAGTA	104
W178R	AGCTCCCATTGACTTCTTCSNNGAGGTCAAAGCCGGTTTG	105
E180R	AGAATGAGCTCCCATTGACSNNTTCCCAGAGGTCAAAGCC	106

TABLE 3-continued

Primers used to Generate TrGA SSM Libraries

Primer	DNA sequence 5' to 3'	SEQ ID NO:
V181R	TAAAGAATGAGCTCCCATTSNNTTCTTCCCAGAGGTCAAA	107
Q208R	ATGAATAAGCGCTTCCCGASNNGCCAAGAGTGGCAGCAAG	108
S211R	GAGCAACAGATGAATAAGCSNNTCCCGACTGGCCAAGAGT	109
W228R	CGTATCCACCAGACGACACSNNGAATCGTTGGAGAAAGCA	110
N242R	CCTTGCCAGTCCTGCCCTCSNNGGTGTTGATGTTGGAGTC	111
E243R	CATCCTTGCCAGTCCTGCCSNNGTTGGTGTTGATGTTGGA	112
R245R	AGTTGACATCCTTGCCAGTSNNGCCCTCGTTGGTGTTGAT	113
I292R	TGCCCTTGTTCACGCCGTASNNGGAGCGGAAGGAGTCGAC	114
G294R	CAGGAATGCCCTTGTTCACSNNGTAGATGGAGCGGAAGGA	115
K297R	CAGCACCGGCAGGAATGCCSNNGTTCACGCCGTAGATGGA	116
R309R	AGTACACATCCTCTGCATASNNGCCAATGGCGACGGCAGC	117
Y310R	TGTAGTACACATCCTCTGCSNNCCGGCCAATGGCGACGGC	118
D313R	GGTTGCCGTTGTAGTACACSNNCTCTGCATACCGGCCAAT	119
V314R	AAGGGTTGCCGTTGTAGTASNNATCCTCTGCATACCGGCC	120
Y315R	ACCAAGGGTTGCCGTTGTASNNCACATCCTCTGCATACCG	121
Y316R	GATACCAAGGGTTGCCGTTSNNGTACACATCCTCTGCATA	122
N317R	CAAGATACCAAGGGTTGCCSNNGTAGTACACATCCTCTGC	123
W321R	CAGCAAATGTAGCAAGATASNNAGGGTTGCCGTTGTAGTA	124
K340R	CCGTGATGGAGCCCGTCTTSNNCCAGACGTAGATGGCATC	125
K341R	TCACCGTGATGGAGCCCGTSNNCTTCCAGACGTAGATGGC	126
T350R	CCTGGAAGAAGGCCAGGGASNNGGCGGTCACCGTGATGGA	127
Q356R	TCACGCCAGGAACAAGCTCSNNGAAGAAGGCCAGGGAGGT	128
T363R	TGCTGGAGTAGGTCCCGGCSNNCACGCCAGGAACAAGCTC	129
S368R	TAAAGGTCGAAGAGCTGCTSNNGTAGGTCCCGGCCGTCAC	130
S369R	TGGTAAAGGTCGAAGAGCTSNNGGAGTAGGTCCCGGCCGT	131
N376R	TCGAGACGGCGTTGATGATSNNGGTAAAGGTCGAAGAGCT	132
Y395R	GCGAACCGTCGGCGGGGACSNNCTTGGCAGCCTCGCTGAG	133
A398R	GCTCGGCCAGCGAACCGTCSNNGGGGACGTACTTGGCAGC	134
S401R	GGTCAAACTGCTCGGCCAGSNNACCGTCGGCGGGGACGTA	135
R408R	ACAGCGGAGTGCCGCTGTTSNNGTCAAACTGCTCGGCCAG	136
N409R	CAGACAGCGGAGTGCCGCTSNNGCGGTCAAACTGCTCGGC	137
T412R	GGTGAAGCGCAGACAGCGGSNNGCCGCTGTTGCGGTCAAA	138
H418R	AGGCGTACGACCACGTCAGSNNAAGCGCAGACAGCGGAGT	139
W421R	TCAAGAACGAGGCGTACGASNNCGTCAGGTGAAGCGCAGA	140
R433R	AGGGGGGCACGATGCCAGCSNNACGGGCCGTGGCTGTCAA	141
I436R	TGGCCCACGAGGGGGGCACSNNGCCAGCCCGACGGGCCGT	142
S451R	CGGACGCGCCGGAGCACGTSNNGGGGATCGTGCTAGCGCT	143

For each library, after overnight incubation at 37° C., colonies were pooled by resuspension of the clones in PSS. From the pooled *E. coli* transformants, total plasmid was isolated (Qiagen) using standard techniques. Briefly 10 of the plasmid solution was added to 1 μl of pRep3Y destination vector (FIG. **1**A) solution and added to the LR Clonase™ II enzyme mix according to the protocol supplied by Invitrogen. A circular multimeric DNA was generated and transformed to *E. coli* Max EfficiencyDH5α as described by the supplier.

After overnight incubation at 37° C., 96 single colonies of each library were picked from 2×TY agar plates with 100 μg/ml ampicillin and grown for 24 hrs at 37° C. in a MTP containing 200 μL 2×TY medium with 100 μg/ml ampicillin. Cultures were used for sequence analyses (BaseClear B.V., Leiden, Netherlands).

The library numbers ranged from 1 to 65 with an addition referring to the codon of the TrGA sequence that is randomly mutated. After selection, each library included a maximum of 19 TrGA variants. These variants were individually transferred to *Schizosaccharomyces pombe* according to manufacturers instruction. (Zymo Research, Orange Calif. USA).

S. pombe transformations were plated on selective medium (EMM agar, Qbiogene, Irvine, USA Cat. No. 4110-232) and incubated at 28° C. for 4 days. Transformants were purified from the transformation plate by streaking the colonies on EMM agar.

Example 2

Description of the Growth Conditions and the Sample Pre-Treatment

S. pombe transformants were inoculated in 96 well microtiter plates (MTP) containing selective medium (2×EMM-C) [64.4 g/L EMM Broth (Qbiogene Cat. No: 4110-032), 0.62 g/L Complete Supplement Mixture (CSM-HIS-LEU-TRP, Qbiogene, Cat. No. 4530-122)] and incubated overnight at 28° C. From the overnight incubated microtiter plate, 2000 of grown *S. pombe* culture was inoculated in 20 ml of 2×EMM-C liquid medium in a 100 ml shake flask and incubated for 4 days at 26° C. at 280 rpm in a Multitron shaking incubator (Infors AG, Bottmingen, Switzerland). From the grown culture, 2 ml of *S. pombe* culture was sampled and centrifuged for 5 min at 14,000 rpm (Sigma). The supernatant was transferred into a 10 kD Vivaspin 500 HT filter set-up (VivaScience AG, Hannover, Germany) and centrifuged for 25 min at 1000 g. The retentate was diluted back to the original start volume with 50 mM NaAc pH 4.5 supplemented with 0.015% Tween-80. This solution was used in the different assays.

Example 3

Construction of a Combinatorial Library of 4 Variants of TrGA

(A) Experiments were conducted for the construction of TrGA-variants carrying combinations of the following single site mutations: Q172F; Q208N; S211R and V314H. A review of the variants is shown below:

a) Q172F; Q208N
b) Q172F; S211R
c) Q172F; V314H
d) Q208N; S211R
e) Q208N V314H
f) S211R; V314H
g) Q172F; Q208N; S211R
h) Q172F; Q208N; V314H
i) Q172F; S211R; V314H
j) Q208N; S211R; V314H
k) Q172F; Q208N; S211R; V314H

The Quikchange® multi site-directed mutagenesis (QCMS) kit (Stratagene) was used to construct the library. The 5' phosphorylated primers used to create the library are shown in Table 4. Optimal results in terms of incorporation of full length primers as well as significant reduction in primer-derived errors were obtained by the use of HPLC, PAGE or any other type of purified primers (Invitrogen).

TABLE 4

Primer	Sequence	SEQ ID NO:
I43R	GCATCTCCCAGCACA**CGA**GACCCGGACTACTAT	144
I43Y	GCATCTCCCAGCACA**TAC**GACCCGGACTACTAT	145
R76L	GATGCGGGCCTGCAG**CTG**CGCATCGAGCAGTAC	146
N119T	CTGAAGCCTTTCACCGGC**ACC**TGGGGTCGACCGCAGCGGG	147
N119Y	TGAAGCCTTTCACCGGC**TAC**TGGGGTCGACCGCAGCGGG	148
N119D	CTGAAGCCTTTCACCGGC**GAC**TGGGGTCGACCGCAGCGGG	149
N146	AGTGGCTCATCAACAAC**GAS**TATCAGTCGACTGTGT	150
N146T	AGTGGCTCATCAACAAC**ACC**TATCAGTCGACTGTGT	151
N146W	GTGGCTCATCAACAA**TGG**TATCAGTCGACTGTGT	152
N146L	AGTGGCTCATCAACAAC**CTG**TATCAGTCGACTGTGT	153
N146S	AGTGGCTCATCAACAAC**TCC**TATCAGTCGACTGTGT	154
Q172D/E	TTGCCCAGTACTGGAAC**GAS**ACCGGCTTTGACCTCTGG	155
Q172V/L	TTGCCCAGTACTGGAAC**STG**ACCGGCTTTGACCTCTGG	156

TABLE 4-continued

Primer	Sequence	SEQ ID NO:
Q172T	TTGCCCAGTACTGGAAC**ACC**ACCGGCTTTGACCTCTGG	157
Q172R	TTGCCCAGTACTGGAAC**CGA**ACCGGCTTTGACCTCTGG	158
Q172C	TTGCCCAGTACTGGAAC**TGC**ACCGGCTTTGACCTCTGG	159

The template plasmid pDONR-TrGA (FIG. **2**) was used to construct the combinatorial library using the QCMS kit of Stratagene. The library was constructed as described by the supplier with modified primer concentrations used in the reactions. Specifically, 4 μl pDONR-TrGA (25-50 ng) was mixed with 11 μl of sterile distilled water; 1.5 μl of dNTP; 2.5 μl of 10×QCMS-buffer; 1 μl of enzyme blend and 1 μl of each mutant primer mix giving a total of 100 ng of primers in each reaction. The PCR conditions were 95° C. for 1 min, followed by 30 cycles of 95° for 1 min, 55° C. for 1 min, and 65° C. for 6 min, in an MJ Research thermocycler using thin-walled 0.2 ml PCR tubes. The reaction product was digested with 1 μl of Dpn1 from the QCMS kit by incubating at 37° C. overnight. A PCR purification kit (Qiagen) was used for sample purification and a second round of digestion was carried out with Dpn1 (Stratagene) for 1 hour at 37° C.

The reaction mixture was transformed to into *E. coli* Max efficiency DH5α (Invitrogen) and plated on selective agar (2×TY supplemented with 50 μg kanamycin/ml). After overnight incubation at 37° C., 96 single colonies were picked for sequence analysis (BaseClear B.V., Leiden, Netherlands). The combinatorial variants were cloned and expressed in a *T. reesei* host strain as described below and in WO 06/060062.

(B) A further six combinatorial libraries (Table 5) were synthetically made by Geneart (Regensburg, Germany) and were tested for thermal stability and in ethanol and sweetener application assays as described herein.

TABLE 5

	combinatorial libraries
1	D24E, L/I43F, R/D44H, N/F175H/V181K, L/V314D, H, K/T363R
2	D24L, W, Y/Q208F/I292F, L, N, V/G294A, I, Q/K297A/Y310F, Q, R
3	V181F, K, L/E243A, N, M, R, y/I292F, L, N, V/K297A, D, H, M, N, Q/N317H/Y395Q, R
4	D24E, L, Y/V181F, K, L/Q208C/F/G294A, I, Q/T363R/N376Q/N409K, W
5	D24E, L, Y/V181F, K, L/I292F, L, N, V/G294A, I, Q/E243A, M, N, R, Y/N409K, W
6	I43R/E243A, M, N, R, Y/I292F, L, N, V/G294A/K297A, D, H, M, N, Q, S, R, W, Y

Example 4

Variants with Improved Thermal Stability

The parent TrGA molecule under the conditions described had a residual activity between 15 and 44% (day-to-day variation). The performance index was calculated based on the TrGA thermostability of the same batch. The performance indices are the quotients PI=(Variant residual activity)/(TrGA residual activity). A performance index >1 indicates an improved stability. Variants which have a thermal stability performance index of more than 1.0 are shown in the following Table 6.

TABLE 6

Themal stability screening			
Variant	PI Thermal Stability, 60° C., pH 4.5	Variant	PI Thermal Stability, 60° C., pH 4.5
D4P	1.05	S211M	1.90
I12E	1.09	E243A	1.19
I12Y	1.40	E243H	1.04
D24L	1.09	E243M	1.53
D24W	1.13	E243N	1.35
D24Y	1.03	E243P	1.06
I43R	1.28	E243R	1.21
D44N	1.06	E243S	1.09
D44Q	1.10	E243T	1.48
Q75N	1.09	E243Y	1.43
R76K	1.03	I292F	1.17
N146D	1.20	I292L	1.10
N146E	1.24	I292N	1.31
N146L	1.10	I292V	1.02
N146V	1.28	G294A	1.30
N146W	1.17	G294C	1.41
Q148D	1.02	G294D	1.31
F175I	1.02	G294E	1.34
F175Y	1.06	G294H	1.17
E180A	1.41	G294I	2.15
E180D	1.02	G294L	2.01
E180G	1.13	G294P	1.13
E180I	1.41	G294Q	1.91
E180L	1.38	G294R	1.34
E180M	1.10	G294V	1.10
E180N	1.27	K297A	1.47
E180Q	1.72	K297C	1.10
E180R	1.59	K297D	1.50
E180V	1.08	K297F	1.24
E180W	1.30	K297G	1.25
E180Y	1.31	K297H	1.63
V181I	1.20	K297L	1.62
V181K	1.12	K297M	1.62
V181L	1.06	K297N	1.87
V181Q	1.09	K297Q	1.82
V181R	1.07	K297R	1.29
Q208F	1.06	K297S	1.22
Q208T	1.17	K297T	1.33
Q208V	1.15	K297V	1.10
S211D	1.10	K297W	1.85
S211E	1.02	K297Y	1.71
S211I	1.31	R309S	1.08
Y310C	1.06	S369P	1.16
Y310F	1.35	S369R	1.12
Y310L	1.11	S369T	1.25
Y310Q	1.40	N376F	1.12
Y310R	1.61	N376G	1.26
Y315E	1.24	N376H	1.21
Y315H	1.48	N376K	1.40
Y315L	1.35	N376L	1.34
Y315N	1.17	N376P	1.05
Y315P	1.19	N376Q	1.11
Y315Q	1.43	N376S	1.09
Y315T	1.34	N376V	1.19
Y316D	1.06	N376W	1.12
N317H	1.26	N376Y	1.05

TABLE 6-continued

Thermal stability screening			
Variant	PI Thermal Stability, 60° C., pH 4.5	Variant	PI Thermal Stability, 60° C., pH 4.5
N317Q	1.09	Y395A	1.05
K340H	1.02	Y395C	1.02
K340R	1.09	Y395F	1.03
K341I	1.10	Y395G	1.13
K341V	1.07	Y395H	1.10
T350G	1.08	Y395L	1.50
T350P	1.08	Y395N	1.20
T350S	1.33	Y395Q	1.18
Q356L	1.20	Y395R	1.14
T363N	1.30	Y395S	1.13
S368C	1.12	Y395T	1.04
S368E	1.07	A398C	1.10
S368F	1.16	A398D	1.39
S368H	1.26	A398F	1.05
S368I	1.15	A398G	1.17
S368L	1.33	A398H	1.33
S368N	1.21	A398I	1.41
S368P	1.05	A398K	1.47
S368Q	1.10	A398L	1.44
S368R	1.14	A398N	1.23
S368T	1.15	A398P	1.38
S368W	1.16	A398Q	1.43
S369A	1.22	A398R	1.59
S369D	1.05	A398S	1.14
S369F	1.20	A398T	1.25
S369G	1.05	A398V	1.29
S369K	1.12	A398W	1.45
S369L	1.49	A398Y	1.38
S369M	1.36	S401A	1.12
S369N	1.25	S401E	1.08
S401I	1.05	N409C	1.18
S401N	1.12	N409D	1.21
S401P	1.15	N409E	1.27
S401R	1.25	N409F	1.32
S401T	1.26	N409G	1.14
S401V	1.18	N409H	1.29
R408A	1.14	N409I	1.56
R408E	1.41	N409K	1.44
R408G	1.15	N409L	1.57
R408H	1.12	N409M	1.17
R408I	1.19	N409Q	1.03
R408K	1.80	N409R	1.29
R408L	1.55	N409V	1.11
R408N	1.09	N409W	1.58
R408Q	1.23	T412L	1.10
R408S	1.17	S451R	1.01
N409A	1.25		

Example 5

High Performing Variants from an Ethanol Screening Assay

Variants were tested in an ethanol screening assay using the assays described above. Table 7 shows the results of the screening assay for variants with a Performance Index (PI)>1.0 compared to the parent TrGA PI. The PI is a measure of specific activity (activity/mg enzyme). The PI of the specific activity is the quotient "Variant-specific activity/WT-specific activity." The PI of the specific activity is 1.0 and a variant with a PI>1.0 has a specific activity that is greater than the parent TrGA. The specific activity is the activity measured by the ethanol screening assay divided by the results obtained in the Bradford assay described above.

TABLE 7

Ethanol Screening			
Variant	P.I. 32° C., pH 4	Variant	P.I. 32° C., pH 4
D4A	1.07	Q75K	1.77
D4C	1.08	R76K	1.06
D4E	1.23	R76L	1.11
D4L	1.34	R76M	1.13
D4R	1.18	R76N	1.02
D4S	1.17	R76T	1.04
F5C	1.35	R76V	1.05
I12L	1.19	R76W	1.02
I12R	1.13	R76Y	1.05
D24E	1.60	D100A	1.08
D24L	1.19	D100I	1.14
D24W	1.03	D100L	1.03
D24Y	1.14	D100M	1.12
F29A	1.05	D100N	1.06
F29C	1.12	D100P	1.09
F29D	1.20	D100Q	1.14
F29E	1.05	D100T	1.06
F29I	1.26	D100W	1.19
F29L	1.42	D100Y	1.05
F29Q	1.01	N119E	1.02
F29S	1.07	N119F	1.03
F29V	1.06	N119Y	1.28
I43D	1.14	N146C	1.11
I43F	1.33	N146E	1.02
I43R	1.21	N146G	1.11
I43Y	1.05	N146H	1.07
D44E	1.37	N146K	1.06
D44F	1.07	Q148H	1.10
D44G	1.03	Q148N	1.05
D44H	1.11	Q148V	1.18
D44K	1.09	Q148W	1.05
D44N	1.07	Q148Y	1.16
D44S	1.08	Y169D	1.18
D44Y	1.07	Y169F	1.10
Y70E	1.02	Y169H	1.05
Y70G	1.06	Y169R	1.02
Y70K	1.01	Q172E	1.08
Y70M	1.36	Q172G	1.05
Y70P	1.15	Q172R	1.22
Y70R	1.40	Q172S	1.03
Y70S	1.04	F175C	1.18
Q75A	1.10	F175H	1.26
F175T	1.28	K297Y	1.80
F175W	1.16	R309L	1.43
F175Y	1.05	Y310F	1.05
V181F	1.28	Y310Q	1.16
V181K	1.35	Y310R	1.24
V181L	1.37	V314D	1.10
V181R	1.01	V314F	1.04
Q208A	1.22	V314H	1.31
Q208C	1.17	V314K	1.08
Q208F	1.12	V314L	1.02
Q208H	1.02	V314N	1.05
Q208I	1.02	V314R	1.06
Q208L	1.32	Y316R	1.42
S211A	1.30	Y316W	1.05
S211E	1.30	N317H	1.14
S211G	1.05	N317K	1.02
S211L	1.04	N317S	1.03
S211M	1.05	N317T	1.23
S211R	1.34	K340D	1.33
S211W	1.07	K340T	1.16
S211Y	1.08	K341D	1.04
E243A	1.23	K341F	1.64
E243L	1.20	K341G	1.64
E243M	1.26	K341L	1.04
E243N	1.28	K341N	1.05
E243R	1.31	K341S	1.06
E243Y	1.25	T350A	1.56
I292F	1.23	T350D	1.04
I292H	1.04	T350E	1.59
I292L	1.21	T350H	1.03
I292N	1.27	T350N	1.06
I292R	1.02	T350Q	1.05
I292V	1.24	T350R	1.02

TABLE 7-continued

Ethanol Screening			
Variant	P.I. 32° C., pH 4	Variant	P.I. 32° C., pH 4
G294A	1.91	Q356D	1.69
G294I	1.92	Q356E	1.07
G294Q	1.99	Q356H	1.03
K297A	1.82	Q356K	1.03
K297D	1.87	T363A	1.04
K297H	1.79	T363C	1.54
K297M	1.91	T363G	1.02
K297N	1.87	T363H	1.09
K297Q	1.85	T363N	1.02
K297R	1.71	T363R	1.61
K297S	1.72	T363V	1.05
K297W	1.70	T363W	1.08
S368D	1.11	A398D	1.05
S368F	1.08	A398P	1.03
S368H	1.04	S401A	1.04
S368L	1.07	S401D	1.01
S368M	1.03	S401G	1.04
S368N	1.02	S401N	1.02
S368W	1.24	S401V	1.06
S369F	1.68	N409K	1.30
S369M	1.04	N409L	1.04
S369T	1.05	N409W	1.31
N376G	1.05	T412A	1.04
N376H	1.10	T412G	1.06
N376Q	1.16	T412K	1.05
N376S	1.06	R433Q	1.16
N376T	1.12	I436A	1.32
N376V	1.64	I436H	1.02
Y395A	1.02	I436T	1.03
Y395C	1.05	S451A	1.03
Y395G	1.02	S451M	1.28
Y395Q	1.63	S451T	1.09
Y395R	1.20	S451Y	1.03
Y395S	1.09		

Example 6

High Performing Variants from a Sweetener Screening Assay

Variants were tested in a sweetener screening assay as described hereinabove. Table 8 shows the results of the screening assay wherein variants with a Performance Index (PI)>1.00 compared to the parent TrGA PI are shown. The PI is a measure of specific activity (activity/mg enzyme). The PI of the specific activity is the quotient "Variant-specific activity/WT-specific activity." The PI of the specific activity is 1.0 and a variant with a PI>1.0 has a specific activity that is greater than the parent TrGA.

TABLE 8

Sweetener screening			
Variant	P.I. 60° C., pH 4.5	Variant	P.I. 60° C., pH 4.5
D4E	1.09	Q208T	1.12
D4L	1.03	S211H	1.16
D4S	1.07	S211M	1.16
D24E	1.45	S211R	1.34
D24L	1.31	S211W	1.09
D24Y	1.01	E243A	1.06
I43D	1.05	E243F	1.01
I43F	1.31	E243N	1.05
I43R	1.28	E243R	1.14
D44E	1.09	E243S	1.09
D44H	1.12	E243Y	1.07
D44N	1.31	R245A	1.01

TABLE 8-continued

Sweetener screening			
Variant	P.I. 60° C., pH 4.5	Variant	P.I. 60° C., pH 4.5
Y70F	1.26	I292N	1.04
Y70L	1.22	I292V	1.12
Q75K	1.12	G294A	1.06
R76K	1.11	G294Q	1.02
R76M	1.03	K297A	1.04
R76P	1.13	K297D	1.10
R76T	1.11	K297Q	1.07
R76W	1.07	V314D	1.22
D100Y	1.04	V314H	1.85
N119E	1.12	V314K	1.34
N119Y	1.01	V314L	1.13
N146D	1.05	V314N	1.08
N146E	1.11	V314R	1.20
Q148D	1.02	V314Y	1.05
Q148W	1.05	Y316R	1.20
Q172H	1.05	N317H	1.25
Q172Y	1.03	N317K	1.03
F175H	1.42	K340D	1.21
F175Y	1.11	K340E	1.05
V181A	1.10	K341D	1.08
V181F	1.01	K341G	1.22
V181K	1.43	K341L	1.08
V181L	1.42	K341N	1.08
Q208C	1.08	K341S	1.12
Q208F	1.20	T350H	1.03
Q208H	1.11	T350L	1.04
Q208L	1.03	Q356D	1.31
Q208N	1.03	Q356E	1.04
Q208S	1.06	Q356K	1.05
T363C	1.08	N409T	1.02
T363G	1.04	N409W	1.01
T363N	1.02	T412G	1.06
T363R	1.50	T412S	1.03
S368G	1.04	I436D	1.02
S368M	1.03	I436Q	1.06
N376G	1.02	I436T	1.16
N376Q	1.07	S451D	1.01
Y395Q	1.01	S451E	1.09
A398H	1.03	S451F	1.02
A398S	1.03	S451H	1.11
S401A	1.01	S451T	1.11
N409K	1.19		

Example 7

Construction of Vectors and Transformation into *Trichoderma reesei* Host Cells

A. Construction of Expression Vectors Comprising a Polynucleotide Encoding a Variant GA

The TrGA expression cassette comprising the DNA sequence SEQ ID NO:4 was cloned into pDONR™ 201, a Gateway® Entry vector (Invitrogen, Carlsbad, Calif.). The TrGA expression cassette was cloned into the Gateway compatible destination vector pTrex3g-DEST (FIG. **5**), which is also described in WO 06/060062, by the Gateway® LR recombination reaction. The pTrex3g-TrGA expression vector (FIG. **5**) enabled the expression of the TrGA protein (SEQ ID NO:2) in a *Trichoderma reesei* host. Vectors were constructed which included modified TrGA cDNA coding at least the following variants (1) V314H; (2) S211R; (3) Q208N and (4) Q172F.

B. Transformation.

An expression vector containing a variant GA was transformed into a *T. reesei* host strain derived from RL-P37 (IA52) and having various gene deletions (Δcbh1, Δcbh2, Δegl1, Δegl2) using particle bombardment by the PDS-1000/Helium System (BioRad Cat. No. 165-02257). The

protocol is outlined below, and reference is also made to examples 6 and 11 of WO 05/001036.

A suspension of spores (approximately 5×10^8 spores/ml) from the strain of *T. reesei* was prepared. 100 µl-200 µl of spore suspension was spread onto the center of plates of Minimal Medium (MM) acetamide medium. (MM acetamide medium had the following composition: 0.6 g/L acetamide; 1.68 g/L CsCl; 20 g/L glucose; 20 g/L KH_2PO_4; 0.6 g/L $CaCl_2.2H_2O$; 1 ml/L 1000×trace elements solution; 20 g/L agar; and pH 5.5. 1 ml/L 400× trace element salt solution: citric acid 175 g/L, $FeSO_4.7H_2O$ 200 g/L, $ZnSO_4.7H_2O$ 16 g/L, $CuSO_4.5H_2O$ 3.2 g/L, $MnSO_4.H_2O$ 1.4 g/L, H_3BO_3 0.8 g/L. The spore suspension was allowed to dry on the surface of the MM acetamide medium.

Transformation followed the manufacturers instruction. Briefly, 60 mg of M10 tungsten particles were placed in a microcentrifuge tube. 1 mL of ethanol was added and allowed to stand for 15 minutes. The particles were centrifuged at 15,000 rpm for 15 seconds. The ethanol was removed and the particles were washed three times with sterile dH_2O before 1 mL of 50% (v/v) sterile glycerol was added. 25 µl of tungsten particle suspension was placed into a microtrifuge tube. While continuously vortexing, the following were added: 0.5-5 µl (100-200 ng/µl) of plasmid DNA, 25 µl of 2.5M $CaCl_2$ and 10 µl of 0.1M spermidine. The particles were centrifuged for 3 seconds. The supernatant was removed and the particles were washed with 200 µl of 70% (v/v) ethanol and centrifuged for 3 seconds. The supernatant was removed and 24 µl 100% ethanol was added, mixed by pipetting, and the tube was placed in an ultrasonic bath, 8 µl aliquots of particles were removed and placed onto the center of macrocarrier disks that were held in a desiccator. Once the tungsten/DNA suspension had dried the microcarrier disk was placed in the bombardment chamber along with the plate of MM acetamide with spores and the bombardment process was performed according to the manufacturers instructions. After bombardment of the plated spores with the tungsten/DNA particles, the plates were incubated at 28° C. Transformed colonies were picked to fresh plates of MM acetamide after 4 days (Pentillä et al. (1987) Gene 61: 155-164).

C. Demonstration of GA activity from the expressed variant TrGA in transformed cells.

After 5 days growth on MM acetamide plates transformants displaying stable morphology were inoculated into 250 ml shake flasks containing 30 ml of Proflo medium. (Proflo medium contained: 30 g/L α-lactose; 6.5 g/L $(NH_4)_2SO_4$; 2 g/L KH_2PO_4; 0.3 g/L $MgSO_4.7H_2O$; 0.2 g/L $CaCl_2.2H_2O$; 1 ml/L 400×trace element salt solution: citric acid 175 g/L, $FeSO_4.7H_2O$ 200 g/L, $ZnSO_4.7H_2O$ 16 g/L, $CuSO_4.5H_2O$ 3.2 g/L, $MnSO_4.H_2O$ 1.4 g/L, H_3BO_3 0.8 g/L; 2 ml/L 10% Tween 80; 22.5 g/L ProFlo cottonseed flour (Traders protein, Memphis, Tenn.); 0.72 g/L $CaCO_3$. After two days growth at 28° C. and 140 rpm, 10% of the Proflo culture was transferred to a 250 ml shake flask containing 30 ml of Lactose Defined Media. The composition of the Lactose defined Media was as follows 5 g/L $(NH_4)_2SO_4$; 33 g/L 1,4-Piperazinebis(propanesulfonic acid) buffer; 9 g/L casamino acids; 4.5 g/L KH_2PO_4; 1.0 g/L $MgSO_4.7H_2O$; 5 ml/L Mazu DF60-P antifoam (Mazur Chemicals, IL); 1000× trace element solution; pH 5.5; 40 ml/L of 40% (w/v) lactose solution was added to the medium after sterilization. The Lactose Defined medium shake flasks were incubated at 28° C., 140 rpm for 4-5 days.

Samples of the culture supernatant were mixed with an appropriate volume of 2× sample loading buffer with reducing agent. Mycelium was removed by centrifugation and the supernatant was analyzed for total protein (BCA Protein Assay Kit, Pierce Cat. No. 23225).

GA activity was measured using the p-nitrophenyl-alpha-D-glucopyranoside (pNPG) assay with pNPG as a substrate (Sigma N-1377). In this assay the ability of glucoamylase to catalyze the hydrolysis of p-nitrophenyl-alpha-D-glucopyranoside (pNPG) to glucose and p-nitrophenol is measured. At an alkaline pH, the nitrophenol forms a yellow color that is proportional to glucoamylase activity and is monitored at 405 nm and compared against an enzyme standard measured as a GAU (Elder, M. T. and Montgomery R. S., Glucoamylase activity in industrial enzyme preparations using colorimetric enzymatic method, Journal of AOAC International, vol. 78(2), 1995). One GAU is defined as the amount of enzyme that will produce 1 gm of reducing sugar calculated as glucose per hour from a soluble starch substrate (4% ds) at pH 4.2 and 60° C.

The protein profile was determined by PAGE electrophoresis on NuPAGE® Novex 10% Bis-Tris Gel with MES SDS Running Buffer (Invitrogen, Carlsbad, Calif., USA).

Example 8

Small Scale Applications Testing of Selected Variants on Soluble Starch

Trichoderma reesei host strains expressing the single variants a) V314H, b) S211R, c) Q172F and d) Q208N were grown in fed-batch 14L fermentors at 34° C., pH 3.5 in nutrient media including glucose (Cerelose DE99), KH_2PO_4, $MgSO_4.7H_2O$, $(NH_4)_2SO_4$, $CaCl_2.2H_2O$, trace elements and Mazu anti-foam (DF6000K). Upon glucose depletion growth temperature and pH were shifted to 28° C. and 4.0, respectively. Cell material was removed by filtration and culture supernatants were collected and concentrated to contain greater than 90% glucoamylase as total protein.

Various kinetic properties were determined for glucose production on soluble potato starch at pH 4.3 at 32° C. and at 60° C. and compared to the wild-type TrGA. Each of the four variants demonstrated increased Vmax (uM glucose/sec) values as compared to the wild type (TrGA) indicating elevated catalytic rates (kcat (sec^{-1})). FIG. **6** illustrates the Vmax of two replicates for each temperature tested.

Example 9

Method to Determine the Performance on EtOH Production of Variants

Validation of the screening was performed on the variants that were identified as having a higher performance index as compared to the parent TrGA (see Table 7/8) using a novel small scale Ethanol application test. 24 variants derived from site evaluation and combinatorial (Table 9) libraries were selected and transformed directly into *T. reesei* for expression and testing on larger scale. The variants were tested for thermal unfolding using Differential Scanning Calorimetry (DSC analysis described hereinbelow) and performance using a novel secondary small scale ethanol application assay. The method consisted of two steps: 1) injection of variants onto an anion exchange column to accurately determine the protein concentration; and 2) titration of variants with three different TrGA concentrations (0.3-0.15-0.075 g/28 g ds) in order to calculate their performance on ethanol production relative to the wild type molecule.

TABLE 9

list of combinatorial variants

variant	mutation
LR8	Q172F/Q208N
LR6	Q172F/Q208N/V314H
LR12	Q172F/S211R
SW3-1	D24E/I43R/D44N/F175H/V181L/V314H/T353R
SW3-2	D24L/I43F/D44N/F175H/V181L/V314H/T353R
ET4-1	D24L/Q208Q/I292V/G294A/K297A/Y310R
ET4-2	D24W/Q208F/I292V/G294Q/K297A/Y310R
ET5-1	V181L/E243A/I292N/K297N/N317N/Y395Q
ET5-2	V181L/E243R/I292F/K297A/N317N/Y395Q
ET7-1	D24Y/V181L/Q208C/G294A/T353R/N375N/N409W
ET7-2	D24L/V181L/Q208C/G294A/T353R/N375Q/N409W
ET8-1	D24E/V181K/E243Y/I292V/G294Q/N409K
ET8-2	D24E/V181F/E243R/I292N/G294I/N409W
ET9-1	I043R/E243R/I292F/G294A/K297A
ET9-2	I043R/E243R/I292L/G294A/K297M

Protein Purification and Determination

A crude enzyme preparation was purified using an AKTA explorer 100 FPLC system (Amersham Biosciences, Piscataway, N.J.). β-Cyclodextrin was (Sigma-Aldrich, Zwijndrecht, The Netherlands; 85.608-8) coupled to epoxy-activated Sepharose beads (GE Healthcare, Diegem, Belgium; 17-0480-01). The column was used to capture glucoamylases from the enzyme preparation. Enzyme was eluted from the beads using 25 mM Tris buffer pH 7.5 or 50 mM sodium acetate buffer pH 4.3 containing 10 mM α-cyclodextrin (Sigma, 28705). Purified samples were analyzed by SDS-PAGE. To accurately determine the protein concentration of the variants an FPLC based protein determination method was developed. The protein concentration of the purified marker TrGA molecule was first determined using a standard Bradford protocol (Bio-Rad cat#500-0205). Subsequently, purified samples were injected onto a ResourceQ_1 ml column (GE Healthcare) and enzyme was eluted with 25 mM Tris pH buffer containing 500 mM NaCl. Peak area was determined and the protein concentration was calculated relative to the peak area of the TrGA standard with known concentration.

Small Scale EtOH Application

Table 10 summarizes the production of ethanol and sugars (DP1, DP2, DP>3) by different combinatorial variants. A sample of corn mash liquefact obtained and diluted to 26% DS using thin stillage. The pH of the slurry was adjusted to pH 4.3 using 4N sulphuric acid. A 100 g aliquot of mash was placed into a 32° C. water bath and allowed to equilibrate. After 100 μl 400 ppm urea addition, 1 ml purified variant TrGA enzyme sample (150 μg/ml) or purified TrGA (300, 150, 75 μg/ml) was added to each corn mash sample. Finally, 333 μl of 30 minutes hydrated 15 g in 45 ml DI water solution of Red Star Red yeast (Lesaffre yeast Corp. Milwaukee, Wis.) was added to each sample. Samples were taken at 5, 21, 28, 48 and 52 hours and analyzed by HPLC using an Aminex HPX-87H column 9 (Bio-Rad).

Ethanol and Carbohydrate Determinations

A 2 ml eppendorf centrifuge tube was filled with fermentor beer and cooled on ice for 10 minutes. The sample was centrifuged for 3 minutes at 14.000×g and 500 μl of the supernatant was transferred to a test tube containing 50 μl of kill solution (1.1 N sulfuric acid) and allowed to stand for 5 minutes. 5.0 ml of water was added to the test tube and then filtered into a 0.22 μm filter plate (multiscreen, Millipore, Amsterdam, the Netherlands) and run on HPLC. Column Temperature: 60° C.; mobile phase: 0.01 N sulfuric acid; flow rate 0.6 ml/min; detector: RI; injection volume: 20 μl. The column separates molecules based on charge and molecular weight; DP1 (monosaccharides); DP2 (disaccharides); DP3 (trisaccharides); DP>3 (oligosaccharides sugars having a degree of polymerization greater than 3); succinic acid; lactic acid; glycerol; methanol; ethanol.

DSC Analysis

The melting temperature of purified enzyme samples (0.2-0.4 mg/ml) was determined using Differential Scanning Calorimetry (DSC).

TABLE 10

Production of ethanol and saccharides

	hours	DP > 3 (m/v)%	DP2 (m/v)%	DP1 (m/v)%	ethanol (v/v)%
TrGA (0.3 mg)	5.5	3.46	2.70	0.91	1.02
	21.5	3.40	0.50	0.06	6.80
	28.5	1.68	1.46	0.07	8.13
	46	0.04	0.71	0.06	10.21
	52.5	0.04	0.45	0.03	10.96
TrGA (0.150 mg)	5.5	3.40	2.43	0.15	1.00
	21.5	3.78	0.21	0.03	4.23
	28.5	3.86	0.20	0.03	5.07
	46	2.73	0.52	0.06	7.86
	52.5	1.70	0.87	0.04	7.92
TrGA (0.075 mg)	5.5	3.43	2.16	−0.01	0.94
	21.5	3.54	0.20	0.03	3.10
	28.5	3.43	0.18	0.03	3.14
	46	3.93	0.18	0.05	4.65
	52.5	4.01	0.18	0.03	4.79
ET7-1	5.5	3.45	2.53	0.21	1.00
	21.5	3.94	0.22	0.04	4.77
	28.5	3.89	0.23	0.04	5.58
	46	1.58	1.22	0.06	8.64
	52.5	0.62	1.50	0.04	9.14
LR8	5.5	3.43	2.50	0.17	1.00
	21.5	3.96	0.22	0.04	4.79
	28.5	3.86	0.21	0.04	6.21
	46	1.27	1.11	0.07	9.17
	52.5	0.45	1.24	0.04	8.73
LR12	5.5	3.47	2.51	0.16	1.05
	21.5	3.86	0.22	0.04	4.44
	28.5	3.94	0.22	0.04	5.30
	46	2.09	1.08	0.07	8.56
	52.5	0.99	1.52	0.04	9.16
LR6	5.5	3.37	2.44	0.18	0.96
	21.5	3.88	0.21	0.04	4.44
	28.5	3.90	0.20	0.04	5.10
	46	2.44	0.64	0.08	8.59
	52.5	1.27	1.01	0.04	8.97
ET8-1	5.5	3.46	2.53	0.22	0.99
	21.5	3.99	0.21	0.04	4.86
	28.5	3.90	0.21	0.04	5.76
	46	1.29	1.11	0.08	8.94
	52.5	0.47	1.25	0.04	9.56
ET7-2	5.5	3.57	2.46	0.17	1.02
	21.5	4.26	0.21	0.03	4.21
	28.5	4.37	0.20	0.04	5.14
	46	3.87	0.27	0.05	7.21
	52.5	3.27	0.33	0.03	8.07

Table 11 represents the final ethanol yields and the performance of the variants at 0.15 mg dosage. The performance was calculated by interpolation of the 0.3 mg and 0.15 mg values of the TrGA by the values of the variants.

TABLE 11

Ethanol Yields

variant	EtOH %(v/v)	performance relative to TrGA
TrGA 0.3 mg	10.21	
TrGA 0.15 mg	7.86	1.00

TABLE 11-continued

Ethanol Yields		
variant	EtOH %(v/v)	performance relative to TrGA
TrGA 0.075 mg	4.65	
ET7-1	8.64	1.33
LR8	9.17	1.56
LR12	8.56	1.30
LR6	8.59	1.31
ET8-1	8.94	1.46
ET7-2	7.21	0.72

All combinatorial variants except ET7-2 performed better than TrGA wild type. LR8 performed the best with a 1.56 improved performance.

Table 12 gives an overview of all single site and combinational mutants tested using the small scale ethanol application assay. Variants that are shaded in Table 12 had a better performance than TrGA and also had a higher thermal unfolding temperature (dTm).

TABLE 12

Performance and thermal unfolding of variants relative to TrGA		
Variant	X TrGA	dTm
LR8	1.56	0.30
ET8-1	1.46	1.60
ET7-1	1.33	0.90
LR6	1.31	0.73
LR12	1.30	−0.13
ET5-2	1.29	−0.31
ET4-2	1.27	0.71
Y213C	1.27	0.06
ET4-1	1.21	−2.64
SW3-1	1.21	0.29
Q172F	1.18	−0.01
V314H	1.17	−0.44
G294I	1.16	−0.22
S211R	1.12	−0.44
Q208N	1.08	−0.22
ET9-1	1.04	−1.33
K297A	1.03	−1.11
SW3-2	1.00	0.88
TrGA	1.00	0.00
G294Q	0.99	−0.86
ET8/2	0.93	−0.01
P94N	0.76	−5.17
ET5-1	0.76	−3.28
ET7-2	0.72	−3.59
S214L/C222F	0.70	−3.98

The results showed that Chromatography (FPLC) was a useful tool to accurately determine the protein concentration. The results also showed that titration of variants with three TrGA concentrations was a valuable method to determine the performance of variants on small scale. Seven variants performed better than TrGA wild type (see Table 12) and also had a higher thermal unfolding temperature and the variants that did not perform as well as TrGA also had a lower Tm.

Example 10: Specific Activity Determination of a Selected Set of Combinatorial and Single Site Variants and Substrate Specificity of LR8

The specific activity of a set of the combinatorial variants and several single site mutants that were used to construct combinatorial variants was analyzed (Table 13). LR8 (PI 1.56 determined with small scale application assay) was further studied with respect to substrate specificity. This was done by setting up an MTP assay to determine the glucose production rates of GA variants and to determine substrate specificity of the LR8 variant. The MTP assay was found to discriminate between variants and all variants except ET7-1 showed higher rates than the wildtype (wt) *Trichoderma reesei* glucoamylase. Further, several variants (LR8/ET8/Q172F) performed 20-30% better than TrGA. LR8 performed better on soluble corn starch and two different samples of corn mash liquefact compared to wildtype.

Substrates used in the following experiments were soluble corn starch stock solution prepared as follows: 8 g soluble corn starch (Sigma # S4180) was dissolved in 100 ml milliQ water and heated in a microwave for 1 minute. The dispersion was boiled for 5 minutes and after cooling the volume was adjusted to 100 ml. 4% soluble corn starch was prepared by diluting the stock solution 1:1 with 100 mM NaAc buffer pH 4. In one experiment, a corn liquefact substrate (NE) was prepared using a moisture analyzer to measure % ds, then substrate was diluted 7.5× with 50 mM NaAc to finally obtain 4% ds. The substrate was centrifuged for 5' at 2000×g and the supernatant was filtered with a 0.22 μm filter. In another experiment, a corn liquefact substrate (BSE) was prepared in the same way, except that the substrate was diluted 10×before centrifugation.

The enzyme was diluted using the Stock solution of 150 μg enzyme/ml (3 μg/180 μl reaction mixture). Solutions were further diluted with 50 mM NaAc pH 4.0 as follows: 300 ng (10×), 200 ng, 150 ng, 100 ng, 75 ng, 50 ng, 25 ng, 10 ng/180 μl reaction mixture

The assay was performed as follows: 40 μl 50 mM NaAc pH 4.0, 120 μl 4% soluble corn starch, and 20 μl enzyme were added to each well. Samples were incubated for 2 hr at 32° C. 900 rpm and terminated on ice after addition of 90 μl 800 mM glycine-NaOH buffer pH 10 for 5 min. The plate was centrifuged for 5 min at 2000 rpm at 15° C. To a fresh plate, 85 μl milliQ water and 100 μl hexokinase cocktail (II test glucose (HK) kit, Instrumental Laboratory #182507-40) and 20 μl supernatant were added. For a glucose (0-1 mg/ml) calibration line 20 μl glucose stock was added instead. Plates were incubated for 10 min at room temperature in the dark followed by absorption measurement at 340 nm using the Spectramax.

TABLE 13

performance relative to wt								
	ng GA							
	300	200	150	100	75	50	25	10
graph1								
TrGA	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ET7-1	0.94	0.98	0.91	0.92	0.63	0.38	3.50	0.53
LR8	0.93	1.00	1.22	0.91	0.64	0.06	−0.89	−3.99
LR12	0.94	0.99	1.17	0.83	0.66	−0.15	−0.99	0.62
LR6	0.94	1.01	1.16	0.99	0.55	0.17	−1.67	−4.36
ET8-1	0.87	0.95	1.29	1.02	0.62	−0.05	−1.64	−3.42
ET7-2	0.94	1.00	1.24	0.93	0.50	0.22	−0.62	−1.40
graph2								
V314H	0.95	0.97	1.24	0.91	0.78	0.54	0.74	1.89
G294Q	0.98	0.99	1.03	1.21	1.10	0.19	−0.34	−1.12
S211R	0.97	0.99	1.21	1.05	0.94	0.27	−1.32	0.53
Q208N	0.97	1.01	1.13	0.95	0.90	−0.05	−1.01	−2.81
Q172F	0.99	1.04	1.31	1.23	1.32	0.38	−1.59	−2.20
G294I	0.91	0.96	1.07	1.25	0.80	0.09	−1.20	−3.66
P94N	0.98	1.00	1.24	1.09	1.05	0.29	6.29	−3.80
TrGA	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

The results of the assay to determine the glucose production rates of by GA variants are shown in FIGS. **7** and **8**. In

these figures, the relative performance to TrGA was calculated per amount of enzyme added. Conclusions were drawn from the linear region of the graph at 150 ng of enzyme. The results in FIGS. **7**, **8** and Table 13 showed that LR8, ET8, ET7-2, S211R, Q172F and P94N performed better than wildtype over the linear range.

Substrate Specificity of LR8—

The performance of LR8 and TrGA wildtype was tested on substrates (soluble corn starch, and the two corn mash substrates produced in Example 10) used in screening and application. When analyzed by HPLC, the substrates showed a difference in degree of polymerization (DP) pattern (see FIGS. **9-11**). In NE and BSE DPI->=DP4 is present while soluble corn starch consist of at least four or more glucose molecules. On all substrates LR8 performed better than wildtype (see FIGS. **9**, **10** and **11**).

Example 11: Crystal Structure of TrGA

The complete three dimensional structure of *Trichoderma reesei* (*Hypocrea jecorina*) glucoamylase (TrGA) was determined at 1.9 Å resolution. Table 15 shows the coordinates for the *Trichoderma* glucoamylase crystal structure. TrGA was crystallized in an intact form containing 599 residues and all post-translational modifications that would normally occur in the natural host. The crystal structure was produced and analyzed as follows:

Protein expression and purification—The gene encoding *H. jecorina* GA was cloned and expressed according to the protocols described in the US patent application with publication No.: US 2006/0094080 A1, by Dunn-Coleman et al. and publication date May 4, 2006.

The TrGA protein material used for all crystallization experiments was initially purified in one step by anion exchange chromatography as follows: concentrated culture supernatants of expressed TrGA, consisting of 180 mg/ml total protein, were prepared by diluting sample 1:10 in a 25 mM Tris-HCl, pH 8.0 buffer. A HiPrep 16/10 Q Sepharose FF column (GE Helthcare) was employed for the anion exchange purification. The HiPrep column was equilibrated with 4 column volumes (CV) starting buffer (25 mM Tris-HCl, pH 8.0) followed by application of 10 ml of the diluted protein sample. An 8 CV linear gradient of 0 to 140 mM NaCl in the running buffer (25 mM Tris-HCl, pH 8.0) was applied to elute bound protein. Bound TrGA eluted from the HiPrep Q sepharose column at a salt concentration of approximately 80 mM NaCl. Fractions containing pure TrGA protein were pooled and concentrated to 50 mg/ml using a 25 ml Vivaspin centrifugal concentration tube (Viva Science) with a molecular weight cutoff (MWCO) of 10 kD. Purified and concentrated TrGA material was buffer exchanged using a DG-10 desalting column (Bio-Rad) equilibrated with 50 mM sodium acetate buffer, pH 4.3. Protein concentrations were determined by measuring the absorbance at 280 nm. The initially purified and concentrated TrGA protein stock was thereafter stored at −20° C.

Two additional purification steps, on additional anion exchange purification, and a size exclusion purification, were introduced to enhance the crystability of the TrGA protein material. These two additional purification steps were performed as follows: In the first anion exchange purification step a 10 ml MonoQ column (GE Helthcare) was employed. A Sample of 1 ml of the initially purified and frozen TrGA material (50 mg protein) was thawed and the buffer was changed to 20 mM Tris-HCl, pH 8.0, by repeated dilution of the sample to 6 ml in the new buffer, followed by a concentration of the sample again to 0.5 ml using a 6 ml 5 kD MWCO concentration tube. The TrGA sample was diluted after the last concentration step in distilled water until a conductivity of the protein sample was reached that corresponded to the conductivity of the starting buffer of the anion purification, i.e. 25 mM Tris-HCl, pH 8.0. The MonoQ column was first equilibrated with 4 column volumes (CV) starting buffer, followed by application of the diluted protein sample to the column. Bound protein was eluted from the MonoQ column by two different gradients. In the first a 4 CV linear pH gradient was applied where the pH of the starting buffer was decreased from 8.0 to 6.0. In the second gradient an 8 CV long salt gradient was applied in which the salt concentration was increased from 0 to 350 mM NaCl in the running buffer (25 mM Tris-HCl, pH 6.0). Bound TrGA was found to elute from the column during the second salt gradient at an approximate NaCl concentration of 150 mM. Fractions containing TrGA were pooled and concentrated to 2 ml using a 6 ml 5 kD MWCO Vivaspin concentration tube. The concentrated TrGA sample was thereafter applied to a Superdex 200 16/60 size exclusion column (GE Helthcare) equilibrated with 4 CV of 20 mM Tris-Cl, pH 8.0, and 50 mM NaCl, which also was used as running buffer. Fractions from the main elution peak after the size exclusion purification were pooled and concentrated to an approximate protein concentration of 7.5 mg/ml using a 6 ml 5 kD MWCO Vivaspin concentration tube.

Protein crystallization—The protein sample that was used to find the initial TrGA crystallization conditions was a sample of the TrGA material that was purified once by anion exchange purification and thereafter stored at −20° C. The TrGA protein sample was thawed and diluted with 50 mM sodium acetate buffer, pH 4.3, to approximately 12 mg/ml, prior to the initial crystallization experiments. The orthorhombic x-ray dataset, was used to solve the TrGA structure by molecular replacement (MR), and the high-resolution orthorhombic dataset, used for the final orthorhombic space group TrGA structure model. The orthorhombic TrGA crystals were found to grow in solution consisting of 25% PEG 3350, 0.20M ammonium acetate, 0.10M Bis-Tris pH 5.5 (reservoir solution), using the vapor-diffusion method with hanging drops (McPherson 1982), at 20° C. Crystallization drops were prepared by mixing equal amounts of protein solution (12 mg/ml) and reservoir solution to a final volume of 10 μl. The TrGA crystals were found to belong to the orthorhombic space group P212121 with approximate cell dimensions: a=52.2 Å, b=99.2 Å, c=121.2 Å, and have a calculated V_m of 2.3 (Matthews 1968) with one molecules in the asymmetric unit.

X-ray data collection—The two orthorhombic TrGA datasets were collected from single crystals mounted in sealed capillary tubes, at room temperature. The initial lo-resolution orthorhombic TrGA x-ray dataset, used to solve the structure by molecular replacement methods (MR), was collected on a home x-ray source, an MSC/Rigaku (Molecular Structures Corp., The Woodlands, Tex.) Raxis IV++ image plate detector with focusing mirrors using Cu Kα radiation from a Rigaku RU200 rotating anode generator. This dataset was processed, scaled, and averaged using the d*trek software provided by MSC/Rigaku. The C centered monoclinic dataset was collected from a single frozen TrGA crystal at 100K, equilibrated in a cryo-protective agent comprised of 25% PEG 3350, 15% Glycerol 50 mM $CaCl_2$ and 0.1 M Bis-Tris pH 5.5 as cryoprotectant, mounted in rayon-fiber loops, and plunge frozen in liquid nitrogen prior to transportation to the synchrotron. The high-resolution orthorhombic (1.9 Å) data set and the C centric monoclinic dataset (1.8 Å) were both collected at a synchrotron source,

beam line 911:5 at MAX LAB in Lund, Sweden. Both datasets that were collected at a synchrotron source were processed with MOSFLM, and scaled with program SCALA included in the CCP4 program package (Collaborative Computational Project Number 4 1994). All subsequent data processing was performed using the CCP4 program package (Collaborative Computational Project Number 4 1994), unless otherwise stated. A set of 5% of the reflections from each data set was set aside and used for monitoring the R-free (Brünger 1992).

Structure solution—The TrGA structure was initially solved by MR with the automatic replacement program MOLREP (Collaborative Computational Project Number 4 1994), included in the CCP4 program package, using the initial lo-resolution orthorhombic dataset, and using the coordinates of *Aspergillus. awamori* GA (AaGA) variant X100 (pdb entry 1GLM (Aleshin et al. 1992)) as search model. The *A. awamori* GA search model was edited to remove all glycosylation moieties attached to the protein molecule as N- and O-glycosylations, and all solvent molecules before carrying out the MR experiments. All reflections between 36.8 and 2.8 Å resolution, from the initial lo resolution TrGA dataset, was used for the MR solution. The MR program found a single rotation function solution, with a maxima of 11.1 σ above background, the next highest maxima was 3.8a above the background. The translation function solution gave an R-factor of 48.7% and had a contrast factor of 17.4. The MR solution was refined for 10 cycles of restrained least squares refinement using the program Refmac 5.0 (Murshudov et al. 1997). This lowered the crystallographic R-factor to 31.1% while the R-free value dropped from 42.2% to 41.1%.

Model fitting and refinement—The refined MR solution model was used to calculate an initial density map from the lo-resolution orthorhombic TrGA dataset. Electron density for a disulfide bridge between residues 19 and 26 of TrGA, a disulfide bridge not present in the *A. awamori* variant X100 structure model, could readily be identified in this electron density map. This was taken as an indication that the electron density map was of sufficient quality to be used to build a structure model of TrGA from its amino acid sequence. The initial TrGA structure model, based on the lo-resolution dataset, was refined with alternating cycles of model building using Coot (Emsley and Cowtan 2004), and maximum likelihood refinement using Refmac 5.0.

The resolution of the initial TrGA structure model was extended to the resolution of the high-resolution orthorhombic dataset (1.9 Å) by refining the initial TrGA structure model against the high-resolution dataset for 10 cycles of restrained refinement using the program Refmac 5.0. Most water molecules in the structure models were located automatically by using the water picking protocols in the refinement programs, and then manually selected or discarded by inspection by eye. All structural comparisons were made with either Coot (Emsley and Cowtan 2004) or O (Jones et al. 1991), and figures were prepared with PyMOL (DeLano 2002).

From these results, it can be seen that the TrGA catalytic core segment followed the same $(\alpha/\alpha)_6$-barrel topology described by Aleshin et al. 1992 for the AaGA, consisting of a double barrel of alpha helices with the C-terminal of the outer helix leading into the N-terminus of an inner helix. It was possible to identify key differences in the electron density such as the disulfide bridge between residues 19 and 26 and an insertion (residues 257-260) relative to AaGA. The segment comprising 80-100 also underwent extensive model rebuilding. One major glycosylation site was identified at Asn 171, which had up to four glycoside moieties attached. A similar glycosylation site was identified in AaGA. Additionally, the catalytic core containing three cis-peptides between residues 22-23, 44-45 and 122-123 were conserved between TrGA and AaGA. Overall there was an rms variation of 0.535 Å between 409 out of 453 Ca atoms when comparing the coordinates of the catalytic cores of TrGA and AaGA.

Example 12: Homology Between TrGA and *Aspergillus awamori* GA

The crystal structure of the TrGA identified in Example 12, was superposed on the previously identified crystal structure of the *Aspergillus awamori* GA (AaGA). The AaGA crystal structure was obtained from the protein database (PDB) and the form of AaGa that was crystallized was the form containing only a catalytic domain. The structure of the *Trichoderma reesei* glucoamylase with all three regions intact was determined to 1.8 Angstrom resolution herein (see Table 15 and Example 12). Using the coordinates (see Table 15) the structure was aligned with the coordinates of the catalytic domain from *Aspergillus awamorii* strain X100 that was determined previously (Aleshin, A. E., Hoffman, C., Firsov, L. M., and Honzatko, R. B. 1994 Refined crystal structures of glucoamylase from *Aspergillus awamori* var. X100. *J Mol Biol* 238: 575-591 and the PDB). As seen in FIGS. **12** and **13** the structure of the catalytic domain overlapped very closely and allowed the identification of equivalent residues based on this structural superposition.

Based on this analysis, sites were identified that could be mutated in TrGA and result in increased stability and/or specific activity. These sites include 108, 124, 175 and 316 at the active site. Also identified were specific pairwise variants Y47W/Y315F and Y47F/Y315W. Other sites identified were 143, D44, P45, D46, R122, R125, V181, E242, Y310, D313, V314, N317, R408, and N409. Because of the high structural homology it is expected that beneficial variants found at sites in *Trichoderma Reesei* GA would have similar consequences in *Aspergillus awamori* and other homologous glucoamylases.

Various modifications and variations of the described methods and system of the invention will be apparent to those skilled in the art without departing from the scope and spirit of the invention. Although the invention has been described in connection with specific preferred embodiments, it should be understood that the invention as claimed should not be unduly limited to such specific embodiments. Indeed, various modifications of the described modes for carrying out the invention which are obvious to those skilled in the art are intended to be within the scope of the following claims.

TABLE 15

CRYST1	52.185	99.232	121.240	90.00	90.00 90.00
ORIGX1	1.000000	0.000000	0.000000	0.00000	
ORIGX2	0.000000	1.000000	0.000000	0.00000	
ORIGX3	0.000000	0.000000	1.000000	0.00000	
SCALE1	0.019163	−0.000001	−0.000001	0.00000	

TABLE 15-continued

SCALE2		0.000000			0.010077	0.000000		0.00000		
SCALE3		0.000000			0.000000	0.008248		0.00000		
ATOM	1	N	SER	A	1	−30.485	30.567	−21.185	1.00	37.11
ATOM	2	CA	SER	A	1	−30.568	29.350	−20.326	1.00	37.00
ATOM	3	CB	SER	A	1	−31.953	28.707	−20.424	1.00	37.27
ATOM	4	OG	SER	A	1	−32.137	28.089	−21.695	1.00	40.11
ATOM	5	C	SER	A	1	−29.519	28.345	−20.772	1.00	35.91
ATOM	6	O	SER	A	1	−29.043	28.415	−21.911	1.00	35.46
ATOM	7	N	VAL	A	2	−29.170	27.425	−19.867	1.00	34.51
ATOM	8	CA	VAL	A	2	−28.302	26.293	−20.179	1.00	33.56
ATOM	9	CB	VAL	A	2	−28.142	25.339	−18.955	1.00	33.84
ATOM	10	CG1	VAL	A	2	−27.349	24.103	−19.316	1.00	34.20
ATOM	11	CG2	VAL	A	2	−27.468	26.057	−17.827	1.00	34.79
ATOM	12	C	VAL	A	2	−28.846	25.506	−21.363	1.00	32.48
ATOM	13	O	VAL	A	2	−28.086	25.109	−22.245	1.00	31.10
ATOM	14	N	ASP	A	3	−30.160	25.286	−21.381	1.00	31.43
ATOM	15	CA	ASP	A	3	−30.791	24.530	−22.457	1.00	31.38
ATOM	16	CB	ASP	A	3	−32.283	24.323	−22.190	1.00	32.17
ATOM	17	CG	ASP	A	3	−32.522	23.492	−20.943	1.00	35.28
ATOM	18	OD1	ASP	A	3	−32.413	22.251	−21.028	1.00	36.80
ATOM	19	OD2	ASP	A	3	−32.786	24.092	−19.870	1.00	40.63
ATOM	20	C	ASP	A	3	−30.556	25.153	−23.818	1.00	30.59
ATOM	21	O	ASP	A	3	−30.282	24.446	−24.778	1.00	30.19
ATOM	22	N	ASP	A	4	−30.644	26.477	−23.875	1.00	29.89
ATOM	23	CA	ASP	A	4	−30.369	27.244	−25.083	1.00	29.99
ATOM	24	CB	ASP	A	4	−30.601	28.731	−24.822	1.00	31.12
ATOM	25	CG	ASP	A	4	−32.088	29.121	−24.785	1.00	34.16
ATOM	26	OD1	ASP	A	4	−32.991	28.260	−24.925	1.00	36.06
ATOM	27	OD2	ASP	A	4	−32.340	30.332	−24.608	1.00	39.96
ATOM	28	C	ASP	A	4	−28.925	27.049	−25.579	1.00	28.65
ATOM	29	O	ASP	A	4	−28.697	26.881	−26.770	1.00	28.51
ATOM	30	N	PHE	A	5	−27.961	27.096	−24.660	1.00	26.74
ATOM	31	CA	PHE	A	5	−26.553	26.860	−24.994	1.00	25.21
ATOM	32	CB	PHE	A	5	−25.666	27.110	−23.764	1.00	25.59
ATOM	33	CG	PHE	A	5	−24.244	26.646	−23.931	1.00	26.03
ATOM	34	CD1	PHE	A	5	−23.395	27.259	−24.854	1.00	27.29
ATOM	35	CE1	PHE	A	5	−22.063	26.823	−25.009	1.00	27.33
ATOM	36	CZ	PHE	A	5	−21.593	25.783	−24.228	1.00	26.77
ATOM	37	CE2	PHE	A	5	−22.425	25.181	−23.286	1.00	28.42
ATOM	38	CD2	PHE	A	5	−23.749	25.617	−23.144	1.00	28.42
ATOM	39	C	PHE	A	5	−26.352	25.438	−25.539	1.00	24.23
ATOM	40	O	PHE	A	5	−25.659	25.244	−26.544	1.00	23.56
ATOM	41	N	ILE	A	6	−26.974	24.458	−24.892	1.00	22.71
ATOM	42	CA	ILE	A	6	−26.835	23.065	−25.312	1.00	22.36
ATOM	43	CB	ILE	A	6	−27.491	22.106	−24.299	1.00	21.86
ATOM	44	CG1	ILE	A	6	−26.744	22.181	−22.956	1.00	22.27
ATOM	45	CD1	ILE	A	6	−27.384	21.347	−21.834	1.00	22.36
ATOM	46	CG2	ILE	A	6	−27.571	20.669	−24.848	1.00	21.69
ATOM	47	C	ILE	A	6	−27.388	22.855	−26.723	1.00	22.84
ATOM	48	O	ILE	A	6	−26.753	22.216	−27.573	1.00	21.76
ATOM	49	N	SER	A	7	−28.556	23.420	−26.996	1.00	23.10
ATOM	50	CA	SER	A	7	−29.146	23.175	−28.309	1.00	23.90
ATOM	51	CB	SER	A	7	−30.627	23.570	−28.320	1.00	25.04
ATOM	52	OG	SER	A	7	−30.717	24.982	−28.282	1.00	30.08
ATOM	53	C	SER	A	7	−28.340	23.874	−29.422	1.00	22.78
ATOM	54	O	SER	A	7	−28.186	23.337	−30.508	1.00	22.94
ATOM	55	N	THR	A	8	−27.800	25.053	−29.140	1.00	22.50
ATOM	56	CA	THR	A	8	−26.984	25.780	−30.115	1.00	23.05
ATOM	57	CB	THR	A	8	−26.834	27.247	−29.698	1.00	23.65
ATOM	58	OG1	THR	A	8	−28.138	27.839	−29.700	1.00	27.60
ATOM	59	CG2	THR	A	8	−25.939	28.018	−30.660	1.00	26.76
ATOM	60	C	THR	A	8	−25.601	25.159	−30.307	1.00	21.46
ATOM	61	O	THR	A	8	−25.109	25.051	−31.437	1.00	21.38
ATOM	62	N	GLU	A	9	−24.978	24.768	−29.200	1.00	19.11
ATOM	63	CA	GLU	A	9	−23.596	24.269	−29.243	1.00	18.01
ATOM	64	CB	GLU	A	9	−22.959	24.334	−27.847	1.00	17.76
ATOM	65	CG	GLU	A	9	−21.449	23.945	−27.794	1.00	17.71
ATOM	66	CD	GLU	A	9	−20.536	24.892	−28.609	1.00	20.86
ATOM	67	OE1	GLU	A	9	−20.949	26.010	−28.971	1.00	19.89
ATOM	68	OE2	GLU	A	9	−19.389	24.500	−28.909	1.00	19.22
ATOM	69	C	GLU	A	9	−23.462	22.846	−29.784	1.00	17.77
ATOM	70	O	GLU	A	9	−22.423	22.505	−30.368	1.00	18.05
ATOM	71	N	THR	A	10	−24.485	22.020	−29.593	1.00	15.87
ATOM	72	CA	THR	A	10	−24.404	20.609	−29.958	1.00	17.31
ATOM	73	CB	THR	A	10	−25.677	19.823	−29.525	1.00	17.46
ATOM	74	OG1	THR	A	10	−25.768	19.860	−28.090	1.00	17.46
ATOM	75	CG2	THR	A	10	−25.616	18.374	−30.037	1.00	18.42
ATOM	76	C	THR	A	10	−24.026	20.346	−31.430	1.00	17.40
ATOM	77	O	THR	A	10	−23.073	19.615	−31.682	1.00	17.22
ATOM	78	N	PRO	A	11	−24.764	20.934	−32.412	1.00	18.30

TABLE 15-continued

ATOM	79	CA	PRO	A	11	−24.346	20.649	−33.798	1.00	18.11
ATOM	80	CB	PRO	A	11	−25.440	21.317	−34.662	1.00	18.57
ATOM	81	CG	PRO	A	11	−26.094	22.310	−33.771	1.00	19.16
ATOM	82	CD	PRO	A	11	−25.975	21.779	−32.361	1.00	18.54
ATOM	83	C	PRO	A	11	−22.963	21.231	−34.142	1.00	17.81
ATOM	84	O	PRO	A	11	−22.241	20.655	−34.964	1.00	17.74
ATOM	85	N	ILE	A	12	−22.601	22.353	−33.520	1.00	16.85
ATOM	86	CA	ILE	A	12	−21.279	22.936	−33.731	1.00	16.66
ATOM	87	CB	ILE	A	12	−21.161	24.319	−33.112	1.00	17.25
ATOM	88	CG1	ILE	A	12	−22.194	25.267	−33.751	1.00	19.25
ATOM	89	CD1	ILE	A	12	−22.289	26.635	−33.101	1.00	21.45
ATOM	90	CG2	ILE	A	12	−19.714	24.855	−33.270	1.00	18.75
ATOM	91	C	ILE	A	12	−20.170	22.023	−33.178	1.00	16.30
ATOM	92	O	ILE	A	12	−19.155	21.798	−33.848	1.00	14.64
ATOM	93	N	ALA	A	13	−20.360	21.527	−31.951	1.00	15.28
ATOM	94	CA	ALA	A	13	−19.375	20.627	−31.304	1.00	15.19
ATOM	95	CB	ALA	A	13	−19.788	20.332	−29.883	1.00	15.31
ATOM	96	C	ALA	A	13	−19.204	19.326	−32.092	1.00	15.37
ATOM	97	O	ALA	A	13	−18.083	18.834	−32.297	1.00	13.56
ATOM	98	N	LEU	A	14	−20.320	18.743	−32.531	1.00	15.13
ATOM	99	CA	LEU	A	14	−20.225	17.503	−33.285	1.00	16.06
ATOM	100	CB	LEU	A	14	−21.630	16.921	−33.510	1.00	17.33
ATOM	101	CG	LEU	A	14	−21.689	15.563	−34.212	1.00	20.02
ATOM	102	CD1	LEU	A	14	−20.946	14.460	−33.471	1.00	23.09
ATOM	103	CD2	LEU	A	14	−23.150	15.225	−34.390	1.00	21.86
ATOM	104	C	LEU	A	14	−19.506	17.749	−34.623	1.00	15.61
ATOM	105	O	LEU	A	14	−18.651	16.947	−35.039	1.00	14.82
ATOM	106	N	ASN	A	15	−19.853	18.852	−35.285	1.00	15.30
ATOM	107	CA	ASN	A	15	−19.236	19.228	−36.567	1.00	16.34
ATOM	108	CB	ASN	A	15	−19.848	20.545	−37.073	1.00	16.07
ATOM	109	CG	ASN	A	15	−19.232	21.010	−38.388	1.00	18.31
ATOM	110	OD1	ASN	A	15	−19.565	20.487	−39.431	1.00	17.60
ATOM	111	ND2	ASN	A	15	−18.312	21.987	−38.325	1.00	21.40
ATOM	112	C	ASN	A	15	−17.736	19.450	−36.405	1.00	15.35
ATOM	113	O	ASN	A	15	−16.926	18.954	−37.198	1.00	15.29
ATOM	114	N	ASN	A	16	−17.385	20.180	−35.355	1.00	14.82
ATOM	115	CA	ASN	A	16	−15.992	20.555	−35.144	1.00	15.27
ATOM	116	CB	ASN	A	16	−15.872	21.693	−34.148	1.00	15.41
ATOM	117	CG	ASN	A	16	−16.276	23.023	−34.737	1.00	16.53
ATOM	118	OD1	ASN	A	16	−16.517	23.136	−35.954	1.00	18.08
ATOM	119	ND2	ASN	A	16	−16.326	24.050	−33.896	1.00	16.35
ATOM	120	C	ASN	A	16	−15.159	19.362	−34.723	1.00	14.91
ATOM	121	O	ASN	A	16	−13.975	19.261	−35.099	1.00	15.34
ATOM	122	N	LEU	A	17	−15.771	18.460	−33.956	1.00	14.29
ATOM	123	CA	LEU	A	17	−15.114	17.191	−33.610	1.00	13.90
ATOM	124	CB	LEU	A	17	−16.003	16.346	−32.672	1.00	13.94
ATOM	125	CG	LEU	A	17	−15.351	15.065	−32.133	1.00	16.81
ATOM	126	CD1	LEU	A	17	−15.933	14.708	−30.779	1.00	20.06
ATOM	127	CD2	LEU	A	17	−15.484	13.880	−33.097	1.00	19.31
ATOM	128	C	LEU	A	17	−14.763	16.409	−34.880	1.00	14.06
ATOM	129	O	LEU	A	17	−13.613	15.957	−35.073	1.00	12.69
ATOM	130	N	LEU	A	18	−15.774	16.215	−35.730	1.00	13.19
ATOM	131	CA	LEU	A	18	−15.589	15.441	−36.957	1.00	14.25
ATOM	132	CB	LEU	A	18	−16.952	15.027	−37.545	1.00	13.56
ATOM	133	CG	LEU	A	18	−17.717	14.013	−36.684	1.00	16.49
ATOM	134	CD1	LEU	A	18	−19.171	13.874	−37.165	1.00	16.33
ATOM	135	CD2	LEU	A	18	−17.020	12.647	−36.655	1.00	18.51
ATOM	136	C	LEU	A	18	−14.703	16.132	−38.007	1.00	13.49
ATOM	137	O	LEU	A	18	−14.083	15.435	−38.820	1.00	14.69
ATOM	138	N	CYS	A	19	−14.613	17.462	−37.964	1.00	13.01
ATOM	139	CA	CYS	A	19	−13.629	18.223	−38.760	1.00	13.22
ATOM	140	CB	CYS	A	19	−13.796	19.738	−38.556	1.00	14.20
ATOM	141	SG	CYS	A	19	−15.125	20.407	−39.642	1.00	16.22
ATOM	142	C	CYS	A	19	−12.182	17.808	−38.450	1.00	13.86
ATOM	143	O	CYS	A	19	−11.278	18.043	−39.259	1.00	13.42
ATOM	144	N	ASN	A	20	−11.968	17.219	−37.272	1.00	13.21
ATOM	145	CA	ASN	A	20	−10.594	16.850	−36.830	1.00	13.62
ATOM	146	CB	ASN	A	20	−10.394	17.184	−35.324	1.00	13.52
ATOM	147	CG	ASN	A	20	−10.242	18.687	−35.055	1.00	16.17
ATOM	148	OD1	ASN	A	20	−10.035	19.119	−33.897	1.00	17.34
ATOM	149	ND2	ASN	A	20	−10.343	19.486	−36.090	1.00	11.87
ATOM	150	C	ASN	A	20	−10.262	15.381	−37.116	1.00	13.99
ATOM	151	O	ASN	A	20	−9.238	14.857	−36.646	1.00	14.28
ATOM	152	N	VAL	A	21	−11.123	14.705	−37.875	1.00	13.41
ATOM	153	CA	VAL	A	21	−10.923	13.287	−38.167	1.00	14.20
ATOM	154	CB	VAL	A	21	−12.177	12.448	−37.827	1.00	14.30
ATOM	155	CG1	VAL	A	21	−11.953	10.971	−38.189	1.00	15.30
ATOM	156	CG2	VAL	A	21	−12.517	12.553	−36.312	1.00	14.17
ATOM	157	C	VAL	A	21	−10.551	13.136	−39.644	1.00	14.35
ATOM	158	O	VAL	A	21	−11.255	13.642	−40.491	1.00	15.68

TABLE 15-continued

ATOM	159	N	GLY	A	22	−9.461	12.449	−39.953	1.00	15.67
ATOM	160	CA	GLY	A	22	−9.061	12.300	−41.377	1.00	15.70
ATOM	161	C	GLY	A	22	−9.843	11.182	−42.060	1.00	17.34
ATOM	162	O	GLY	A	22	−10.453	10.358	−41.397	1.00	17.15
ATOM	163	N	PRO	A	23	−9.806	11.117	−43.404	1.00	18.42
ATOM	164	CA	PRO	A	23	−9.009	11.946	−44.278	1.00	18.20
ATOM	165	CB	PRO	A	23	−8.716	10.990	−45.446	1.00	18.64
ATOM	166	CG	PRO	A	23	−9.983	10.171	−45.560	1.00	18.81
ATOM	167	CD	PRO	A	23	−10.568	10.092	−44.153	1.00	18.59
ATOM	168	C	PRO	A	23	−9.761	13.182	−44.753	1.00	19.05
ATOM	169	O	PRO	A	23	−9.183	14.055	−45.426	1.00	19.36
ATOM	170	N	ASP	A	24	−11.034	13.288	−44.385	1.00	18.76
ATOM	171	CA	ASP	A	24	−11.878	14.305	−44.996	1.00	19.39
ATOM	172	CB	ASP	A	24	−13.015	13.636	−45.781	1.00	20.87
ATOM	173	CG	ASP	A	24	−13.920	12.784	−44.913	1.00	24.34
ATOM	174	OD1	ASP	A	24	−13.502	12.291	−43.839	1.00	27.70
ATOM	175	OD2	ASP	A	24	−15.079	12.580	−45.330	1.00	28.83
ATOM	176	C	ASP	A	24	−12.452	15.372	−44.061	1.00	18.08
ATOM	177	O	ASP	A	24	−13.208	16.245	−44.509	1.00	17.78
ATOM	178	N	GLY	A	25	−12.100	15.331	−42.775	1.00	16.65
ATOM	179	CA	GLY	A	25	−12.634	16.343	−41.852	1.00	16.02
ATOM	180	C	GLY	A	25	−12.152	17.718	−42.292	1.00	15.70
ATOM	181	O	GLY	A	25	−11.033	17.849	−42.811	1.00	16.22
ATOM	182	N	CYS	A	26	−12.979	18.752	−42.086	1.00	15.10
ATOM	183	CA	CYS	A	26	−12.698	20.078	−42.637	1.00	15.46
ATOM	184	CB	CYS	A	26	−13.899	21.037	−42.475	1.00	15.47
ATOM	185	SG	CYS	A	26	−14.147	21.739	−40.786	1.00	16.91
ATOM	186	C	CYS	A	26	−11.407	20.731	−42.116	1.00	15.65
ATOM	187	O	CYS	A	26	−10.896	21.643	−42.763	1.00	15.80
ATOM	188	N	ARG	A	27	−10.879	20.259	−40.973	1.00	15.02
ATOM	189	CA	ARG	A	27	−9.615	20.808	−40.443	1.00	14.56
ATOM	190	CB	ARG	A	27	−9.819	21.480	−39.066	1.00	15.00
ATOM	191	CG	ARG	A	27	−10.695	22.728	−39.164	1.00	15.15
ATOM	192	CD	ARG	A	27	−10.826	23.551	−37.888	1.00	14.30
ATOM	193	NE	ARG	A	27	−11.874	24.566	−38.080	1.00	15.05
ATOM	194	CZ	ARG	A	27	−13.160	24.420	−37.761	1.00	17.96
ATOM	195	NH1	ARG	A	27	−13.623	23.293	−37.211	1.00	17.37
ATOM	196	NH2	ARG	A	27	−14.009	25.415	−38.025	1.00	19.55
ATOM	197	C	ARG	A	27	−8.489	19.776	−40.394	1.00	15.49
ATOM	198	O	ARG	A	27	−7.389	20.079	−39.888	1.00	15.40
ATOM	199	N	ALA	A	28	−8.768	18.577	−40.910	1.00	15.17
ATOM	200	CA	ALA	A	28	−7.805	17.484	−40.988	1.00	16.06
ATOM	201	CB	ALA	A	28	−8.163	16.374	−39.975	1.00	15.52
ATOM	202	C	ALA	A	28	−7.744	16.913	−42.394	1.00	16.96
ATOM	203	O	ALA	A	28	−7.453	15.730	−42.581	1.00	17.60
ATOM	204	N	PHE	A	29	−8.028	17.756	−43.380	1.00	17.45
ATOM	205	CA	PHE	A	29	−8.188	17.272	−44.744	1.00	18.68
ATOM	206	CB	PHE	A	29	−8.728	18.376	−45.636	1.00	19.45
ATOM	207	CG	PHE	A	29	−9.299	17.864	−46.919	1.00	20.86
ATOM	208	CD1	PHE	A	29	−8.515	17.827	−48.071	1.00	23.76
ATOM	209	CE1	PHE	A	29	−9.042	17.343	−49.267	1.00	25.46
ATOM	210	CZ	PHE	A	29	−10.357	16.889	−49.318	1.00	22.85
ATOM	211	CE2	PHE	A	29	−11.151	16.924	−48.180	1.00	24.78
ATOM	212	CD2	PHE	A	29	−10.611	17.408	−46.973	1.00	22.71
ATOM	213	C	PHE	A	29	−6.853	16.783	−45.296	1.00	19.10
ATOM	214	O	PHE	A	29	−5.862	17.501	−45.224	1.00	19.40
ATOM	215	N	GLY	A	30	−6.830	15.558	−45.816	1.00	18.73
ATOM	216	CA	GLY	A	30	−5.603	15.008	−46.398	1.00	19.00
ATOM	217	C	GLY	A	30	−4.717	14.307	−45.399	1.00	19.69
ATOM	218	O	GLY	A	30	−3.657	13.809	−45.768	1.00	19.61
ATOM	219	N	THR	A	31	−5.133	14.255	−44.123	1.00	18.86
ATOM	220	CA	THR	A	31	−4.450	13.384	−43.165	1.00	19.14
ATOM	221	CB	THR	A	31	−4.846	13.689	−41.689	1.00	18.79
ATOM	222	OG1	THR	A	31	−6.265	13.579	−41.559	1.00	18.61
ATOM	223	CG2	THR	A	31	−4.410	15.106	−41.262	1.00	16.47
ATOM	224	C	THR	A	31	−4.812	11.925	−43.498	1.00	19.11
ATOM	225	O	THR	A	31	−5.713	11.661	−44.313	1.00	19.69
ATOM	226	N	SER	A	32	−4.107	10.982	−42.881	1.00	19.74
ATOM	227	CA	SER	A	32	−4.367	9.554	−43.094	1.00	20.00
ATOM	228	CB	SER	A	32	−3.411	8.722	−42.248	1.00	20.73
ATOM	229	OG	SER	A	32	−2.064	8.973	−42.612	1.00	21.56
ATOM	230	C	SER	A	32	−5.806	9.217	−42.704	1.00	20.57
ATOM	231	O	SER	A	32	−6.334	9.778	−41.732	1.00	20.70
ATOM	232	N	ALA	A	33	−6.443	8.319	−43.452	1.00	19.94
ATOM	233	CA	ALA	A	33	−7.768	7.823	−43.068	1.00	19.61
ATOM	234	CB	ALA	A	33	−8.232	6.729	−44.035	1.00	19.31
ATOM	235	C	ALA	A	33	−7.764	7.285	−41.637	1.00	19.10
ATOM	236	O	ALA	A	33	−6.906	6.482	−41.264	1.00	19.49
ATOM	237	N	GLY	A	34	−8.742	7.719	−40.856	1.00	17.74
ATOM	238	CA	GLY	A	34	−8.878	7.282	−39.473	1.00	18.31

TABLE 15-continued

ATOM	239	C	GLY	A	34	−7.988	8.020	−38.473	1.00	18.48
ATOM	240	O	GLY	A	34	−8.050	7.739	−37.271	1.00	19.07
ATOM	241	N	ALA	A	35	−7.173	8.959	−38.937	1.00	17.05
ATOM	242	CA	ALA	A	35	−6.329	9.723	−38.000	1.00	17.17
ATOM	243	CB	ALA	A	35	−5.167	10.376	−38.730	1.00	17.10
ATOM	244	C	ALA	A	35	−7.173	10.784	−37.271	1.00	16.55
ATOM	245	O	ALA	A	35	−8.174	11.271	−37.808	1.00	17.35
ATOM	246	N	VAL	A	36	−6.793	11.130	−36.051	1.00	15.39
ATOM	247	CA	VAL	A	36	−7.490	12.198	−35.328	1.00	14.41
ATOM	248	CB	VAL	A	36	−8.142	11.687	−34.031	1.00	15.02
ATOM	249	CG1	VAL	A	36	−8.903	12.828	−33.349	1.00	16.72
ATOM	250	CG2	VAL	A	36	−9.081	10.520	−34.336	1.00	16.45
ATOM	251	C	VAL	A	36	−6.407	13.201	−34.944	1.00	14.36
ATOM	252	O	VAL	A	36	−5.421	12.816	−34.311	1.00	14.44
ATOM	253	N	ILE	A	37	−6.566	14.454	−35.331	1.00	13.68
ATOM	254	CA	ILE	A	37	−5.614	15.470	−34.893	1.00	13.67
ATOM	255	CB	ILE	A	37	−5.528	16.687	−35.849	1.00	13.66
ATOM	256	CG1	ILE	A	37	−6.847	17.486	−35.901	1.00	14.31
ATOM	257	CD1	ILE	A	37	−6.773	18.712	−36.864	1.00	14.21
ATOM	258	CG2	ILE	A	37	−5.158	16.214	−37.260	1.00	14.62
ATOM	259	C	ILE	A	37	−6.041	15.908	−33.505	1.00	13.27
ATOM	260	O	ILE	A	37	−7.235	16.011	−33.224	1.00	12.99
ATOM	261	N	ALA	A	38	−5.081	16.159	−32.630	1.00	13.03
ATOM	262	CA	ALA	A	38	−5.445	16.697	−31.333	1.00	12.81
ATOM	263	CB	ALA	A	38	−4.235	16.680	−30.377	1.00	12.73
ATOM	264	C	ALA	A	38	−6.046	18.122	−31.497	1.00	12.45
ATOM	265	O	ALA	A	38	−6.939	18.503	−30.775	1.00	12.23
ATOM	266	N	SER	A	39	−5.555	18.870	−32.482	1.00	12.90
ATOM	267	CA	SER	A	39	−5.973	20.246	−32.769	1.00	12.85
ATOM	268	CB	SER	A	39	−5.512	21.211	−31.657	1.00	12.63
ATOM	269	OG	SER	A	39	−5.312	22.563	−32.108	1.00	12.57
ATOM	270	C	SER	A	39	−5.281	20.593	−34.090	1.00	13.33
ATOM	271	O	SER	A	39	−4.215	20.043	−34.376	1.00	13.48
ATOM	272	N	PRO	A	40	−5.880	21.500	−34.885	1.00	13.12
ATOM	273	CA	PRO	A	40	−5.248	21.999	−36.108	1.00	13.76
ATOM	274	CB	PRO	A	40	−6.407	22.689	−36.860	1.00	14.41
ATOM	275	CG	PRO	A	40	−7.386	23.045	−35.797	1.00	14.32
ATOM	276	CD	PRO	A	40	−7.223	22.081	−34.665	1.00	13.18
ATOM	277	C	PRO	A	40	−4.126	23.010	−35.860	1.00	14.27
ATOM	278	O	PRO	A	40	−3.474	23.420	−36.824	1.00	14.43
ATOM	279	N	SER	A	41	−3.864	23.381	−34.599	1.00	13.42
ATOM	280	CA	SER	A	41	−2.799	24.336	−34.318	1.00	14.56
ATOM	281	CB	SER	A	41	−2.788	24.817	−32.840	1.00	14.40
ATOM	282	OG	SER	A	41	−3.962	25.574	−32.534	1.00	16.91
ATOM	283	C	SER	A	41	−1.446	23.713	−34.676	1.00	14.51
ATOM	284	O	SER	A	41	−1.123	22.626	−34.218	1.00	13.96
ATOM	285	N	THR	A	42	−0.650	24.433	−35.470	1.00	15.63
ATOM	286	CA	THR	A	42	0.652	23.924	−35.919	1.00	16.17
ATOM	287	CB	THR	A	42	0.750	23.997	−37.458	1.00	17.02
ATOM	288	OG1	THR	A	42	0.267	25.283	−37.890	1.00	17.03
ATOM	289	CG2	THR	A	42	−0.110	22.906	−38.078	1.00	16.03
ATOM	290	C	THR	A	42	1.814	24.732	−35.322	1.00	17.44
ATOM	291	O	THR	A	42	2.967	24.297	−35.382	1.00	17.10
ATOM	292	N	ILE	A	43	1.509	25.913	−34.787	1.00	18.37
ATOM	293	CA	ILE	A	43	2.510	26.786	−34.171	1.00	20.62
ATOM	294	CB	ILE	A	43	2.923	27.952	−35.114	1.00	20.73
ATOM	295	CG1	ILE	A	43	3.550	27.428	−36.411	1.00	21.88
ATOM	296	CD1	ILE	A	43	3.788	28.507	−37.508	1.00	22.99
ATOM	297	CG2	ILE	A	43	3.895	28.910	−34.409	1.00	21.41
ATOM	298	C	ILE	A	43	1.908	27.395	−32.935	1.00	21.00
ATOM	299	O	ILE	A	43	0.796	27.921	−32.995	1.00	21.76
ATOM	300	N	ASP	A	44	2.683	27.470	−31.874	1.00	21.61
ATOM	301	CA	ASP	A	44	2.237	27.975	−30.572	1.00	23.04
ATOM	302	CB	ASP	A	44	2.408	29.506	−30.492	1.00	24.75
ATOM	303	CG	ASP	A	44	2.170	30.064	−29.098	1.00	31.28
ATOM	304	OD1	ASP	A	44	2.362	29.340	−28.094	1.00	37.92
ATOM	305	OD2	ASP	A	44	1.766	31.260	−28.997	1.00	40.00
ATOM	306	C	ASP	A	44	0.782	27.608	−30.196	1.00	21.65
ATOM	307	O	ASP	A	44	−0.046	28.502	−29.981	1.00	22.69
ATOM	308	N	PRO	A	45	0.441	26.449	−29.805	1.00	19.86
ATOM	309	CA	PRO	A	45	1.356	25.320	−29.775	1.00	18.66
ATOM	310	CB	PRO	A	45	0.883	24.549	−28.549	1.00	18.40
ATOM	311	CG	PRO	A	45	−0.653	24.763	−28.586	1.00	18.13
ATOM	312	CD	PRO	A	45	−0.899	26.066	−29.318	1.00	20.04
ATOM	313	C	PRO	A	45	1.253	24.454	−31.026	1.00	17.74
ATOM	314	O	PRO	A	45	0.368	24.652	−31.858	1.00	17.36
ATOM	315	N	ASP	A	46	2.178	23.512	−31.160	1.00	15.95
ATOM	316	CA	ASP	A	46	2.124	22.573	−32.275	1.00	14.75
ATOM	317	CB	ASP	A	46	3.551	22.255	−32.738	1.00	14.59
ATOM	318	CG	ASP	A	46	3.601	21.161	−33.818	1.00	16.17

TABLE 15-continued

ATOM	319	OD1	ASP	A	46	2.543	20.787	−34.389	1.00	15.61
ATOM	320	OD2	ASP	A	46	4.712	20.641	−34.054	1.00	20.18
ATOM	321	C	ASP	A	46	1.436	21.303	−31.748	1.00	13.83
ATOM	322	O	ASP	A	46	2.081	20.489	−31.089	1.00	13.59
ATOM	323	N	TYR	A	47	0.126	21.165	−31.992	1.00	11.86
ATOM	324	CA	TYR	A	47	−0.621	19.975	−31.580	1.00	12.11
ATOM	325	CB	TYR	A	47	−1.895	20.387	−30.854	1.00	11.69
ATOM	326	CG	TYR	A	47	−1.773	20.722	−29.377	1.00	12.59
ATOM	327	CD1	TYR	A	47	−0.589	21.236	−28.827	1.00	13.54
ATOM	328	CE1	TYR	A	47	−0.524	21.586	−27.462	1.00	12.81
ATOM	329	CZ	TYR	A	47	−1.652	21.407	−26.673	1.00	13.40
ATOM	330	OH	TYR	A	47	−1.620	21.755	−25.354	1.00	13.08
ATOM	331	CE2	TYR	A	47	−2.825	20.887	−27.208	1.00	12.02
ATOM	332	CD2	TYR	A	47	−2.876	20.540	−28.532	1.00	12.76
ATOM	333	C	TYR	A	47	−0.994	19.090	−32.772	1.00	11.46
ATOM	334	O	TYR	A	47	−1.885	18.239	−32.692	1.00	11.66
ATOM	335	N	TYR	A	48	−0.316	19.301	−33.893	1.00	12.26
ATOM	336	CA	TYR	A	48	−0.697	18.639	−35.132	1.00	12.80
ATOM	337	CB	TYR	A	48	−0.323	19.509	−36.348	1.00	12.75
ATOM	338	CG	TYR	A	48	−1.134	19.146	−37.569	1.00	13.21
ATOM	339	CD1	TYR	A	48	−2.492	19.482	−37.652	1.00	14.46
ATOM	340	CE1	TYR	A	48	−3.254	19.124	−38.767	1.00	15.86
ATOM	341	CZ	TYR	A	48	−2.643	18.453	−39.823	1.00	14.62
ATOM	342	OH	TYR	A	48	−3.390	18.106	−40.936	1.00	16.20
ATOM	343	CE2	TYR	A	48	−1.295	18.086	−39.756	1.00	15.86
ATOM	344	CD2	TYR	A	48	−0.543	18.456	−38.638	1.00	13.44
ATOM	345	C	TYR	A	48	−0.072	17.245	−35.187	1.00	13.47
ATOM	346	O	TYR	A	48	0.877	16.986	−35.940	1.00	13.95
ATOM	347	N	TYR	A	49	−0.592	16.360	−34.338	1.00	13.13
ATOM	348	CA	TYR	A	49	−0.131	14.987	−34.171	1.00	13.51
ATOM	349	CB	TYR	A	49	0.887	14.842	−33.009	1.00	13.11
ATOM	350	CG	TYR	A	49	2.133	15.662	−33.216	1.00	13.90
ATOM	351	CD1	TYR	A	49	3.193	15.174	−33.996	1.00	13.54
ATOM	352	CE1	TYR	A	49	4.354	15.964	−34.216	1.00	13.41
ATOM	353	CZ	TYR	A	49	4.419	17.225	−33.665	1.00	14.69
ATOM	354	OH	TYR	A	49	5.511	18.016	−33.883	1.00	17.21
ATOM	355	CE2	TYR	A	49	3.365	17.737	−32.906	1.00	13.49
ATOM	356	CD2	TYR	A	49	2.227	16.952	−32.698	1.00	13.78
ATOM	357	C	TYR	A	49	−1.349	14.181	−33.783	1.00	13.93
ATOM	358	O	TYR	A	49	−2.390	14.759	−33.406	1.00	13.00
ATOM	359	N	MET	A	50	−1.203	12.857	−33.839	1.00	13.66
ATOM	360	CA	MET	A	50	−2.241	11.940	−33.365	1.00	14.56
ATOM	361	CB	MET	A	50	−2.447	10.822	−34.381	1.00	15.21
ATOM	362	CG	MET	A	50	−3.532	9.811	−33.947	1.00	15.64
ATOM	363	SD	MET	A	50	−3.996	8.804	−35.361	1.00	19.52
ATOM	364	CE	MET	A	50	−5.204	7.742	−34.566	1.00	17.12
ATOM	365	C	MET	A	50	−1.797	11.323	−32.060	1.00	14.38
ATOM	366	O	MET	A	50	−0.806	10.583	−32.024	1.00	13.80
ATOM	367	N	TRP	A	51	−2.528	11.608	−30.984	1.00	13.47
ATOM	368	CA	TRP	A	51	−2.265	10.965	−29.720	1.00	13.13
ATOM	369	CB	TRP	A	51	−2.598	11.930	−28.585	1.00	12.85
ATOM	370	CG	TRP	A	51	−1.478	12.809	−28.116	1.00	13.64
ATOM	371	CD1	TRP	A	51	−0.671	12.604	−27.011	1.00	13.49
ATOM	372	NE1	TRP	A	51	0.211	13.657	−26.864	1.00	12.36
ATOM	373	CE2	TRP	A	51	−0.023	14.573	−27.858	1.00	11.83
ATOM	374	CD2	TRP	A	51	−1.076	14.065	−28.674	1.00	13.12
ATOM	375	CE3	TRP	A	51	−1.506	14.825	−29.772	1.00	11.07
ATOM	376	CZ3	TRP	A	51	−0.859	16.061	−30.035	1.00	12.87
ATOM	377	CH2	TRP	A	51	0.193	16.522	−29.218	1.00	13.24
ATOM	378	CZ2	TRP	A	51	0.618	15.806	−28.127	1.00	12.61
ATOM	379	C	TRP	A	51	−3.136	9.732	−29.575	1.00	13.35
ATOM	380	O	TRP	A	51	−4.322	9.769	−29.907	1.00	12.89
ATOM	381	N	THR	A	52	−2.576	8.652	−29.024	1.00	13.20
ATOM	382	CA	THR	A	52	−3.386	7.462	−28.753	1.00	13.02
ATOM	383	CB	THR	A	52	−2.520	6.300	−28.235	1.00	13.66
ATOM	384	OG1	THR	A	52	−1.553	5.999	−29.246	1.00	15.07
ATOM	385	CG2	THR	A	52	−3.341	5.026	−27.952	1.00	12.21
ATOM	386	C	THR	A	52	−4.533	7.807	−27.800	1.00	12.48
ATOM	387	O	THR	A	52	−5.670	7.402	−28.034	1.00	12.78
ATOM	388	N	ARG	A	53	−4.224	8.556	−26.747	1.00	12.03
ATOM	389	CA	ARG	A	53	−5.238	8.868	−25.737	1.00	11.89
ATOM	390	CB	ARG	A	53	−4.607	9.570	−24.545	1.00	11.46
ATOM	391	CG	ARG	A	53	−5.611	10.330	−23.618	1.00	13.19
ATOM	392	CD	ARG	A	53	−4.896	10.881	−22.375	1.00	11.14
ATOM	393	NE	ARG	A	53	−3.793	11.694	−22.819	1.00	12.52
ATOM	394	CZ	ARG	A	53	−2.509	11.330	−22.769	1.00	13.67
ATOM	395	NH1	ARG	A	53	−2.148	10.182	−22.180	1.00	13.97
ATOM	396	NH2	ARG	A	53	−1.590	12.151	−23.270	1.00	13.05
ATOM	397	C	ARG	A	53	−6.395	9.709	−26.319	1.00	12.45
ATOM	398	O	ARG	A	53	−7.558	9.289	−26.244	1.00	11.74

TABLE 15-continued

ATOM	399	N	ASP	A	54	−6.090	10.885	−26.874	1.00	11.73
ATOM	400	CA	ASP	A	54	−7.169	11.747	−27.385	1.00	11.90
ATOM	401	CB	ASP	A	54	−6.638	13.018	−28.053	1.00	12.25
ATOM	402	CG	ASP	A	54	−5.794	13.879	−27.120	1.00	13.97
ATOM	403	OD1	ASP	A	54	−4.983	13.332	−26.354	1.00	13.57
ATOM	404	OD2	ASP	A	54	−5.910	15.110	−27.215	1.00	13.88
ATOM	405	C	ASP	A	54	−8.002	11.005	−28.420	1.00	12.00
ATOM	406	O	ASP	A	54	−9.236	11.138	−28.454	1.00	10.97
ATOM	407	N	SER	A	55	−7.334	10.250	−29.297	1.00	11.19
ATOM	408	CA	SER	A	55	−8.034	9.544	−30.388	1.00	12.36
ATOM	409	CB	SER	A	55	−7.017	8.901	−31.340	1.00	13.05
ATOM	410	OG	SER	A	55	−6.171	9.930	−31.882	1.00	14.23
ATOM	411	C	SER	A	55	−8.996	8.489	−29.838	1.00	12.57
ATOM	412	O	SER	A	55	−10.130	8.348	−30.327	1.00	12.76
ATOM	413	N	ALA	A	56	−8.556	7.764	−28.819	1.00	12.60
ATOM	414	CA	ALA	A	56	−9.373	6.718	−28.218	1.00	13.25
ATOM	415	CB	ALA	A	56	−8.517	5.830	−27.329	1.00	12.73
ATOM	416	C	ALA	A	56	−10.551	7.301	−27.415	1.00	13.85
ATOM	417	O	ALA	A	56	−11.640	6.723	−27.409	1.00	14.51
ATOM	418	N	LEU	A	57	−10.328	8.420	−26.723	1.00	14.23
ATOM	419	CA	LEU	A	57	−11.417	9.059	−25.954	1.00	13.95
ATOM	420	CB	LEU	A	57	−10.891	10.186	−25.060	1.00	14.45
ATOM	421	CG	LEU	A	57	−10.088	9.751	−23.834	1.00	14.89
ATOM	422	CD1	LEU	A	57	−9.507	11.013	−23.161	1.00	16.19
ATOM	423	CD2	LEU	A	57	−10.919	8.911	−22.867	1.00	16.02
ATOM	424	C	LEU	A	57	−12.483	9.609	−26.886	1.00	13.92
ATOM	425	O	LEU	A	57	−13.685	9.488	−26.627	1.00	13.70
ATOM	426	N	VAL	A	58	−12.027	10.199	−27.975	1.00	13.15
ATOM	427	CA	VAL	A	58	−12.920	10.751	−28.989	1.00	15.20
ATOM	428	CB	VAL	A	58	−12.133	11.605	−30.031	1.00	14.52
ATOM	429	CG1	VAL	A	58	−12.970	11.861	−31.302	1.00	17.86
ATOM	430	CG2	VAL	A	58	−11.704	12.954	−29.393	1.00	15.79
ATOM	431	C	VAL	A	58	−13.704	9.624	−29.655	1.00	15.20
ATOM	432	O	VAL	A	58	−14.930	9.718	−29.784	1.00	15.30
ATOM	433	N	PHE	A	59	−13.026	8.553	−30.058	1.00	15.02
ATOM	434	CA	PHE	A	59	−13.766	7.477	−30.713	1.00	15.23
ATOM	435	CB	PHE	A	59	−12.882	6.601	−31.582	1.00	15.78
ATOM	436	CG	PHE	A	59	−12.859	7.058	−33.003	1.00	15.10
ATOM	437	CD1	PHE	A	59	−11.872	7.927	−33.444	1.00	16.45
ATOM	438	CE1	PHE	A	59	−11.861	8.401	−34.768	1.00	19.37
ATOM	439	CZ	PHE	A	59	−12.876	8.026	−35.644	1.00	16.44
ATOM	440	CE2	PHE	A	59	−13.901	7.165	−35.186	1.00	16.90
ATOM	441	CD2	PHE	A	59	−13.895	6.709	−33.882	1.00	16.17
ATOM	442	C	PHE	A	59	−14.674	6.681	−29.785	1.00	15.69
ATOM	443	O	PHE	A	59	−15.699	6.175	−30.220	1.00	15.46
ATOM	444	N	LYS	A	60	−14.321	6.586	−28.510	1.00	15.65
ATOM	445	CA	LYS	A	60	−15.257	5.994	−27.552	1.00	16.61
ATOM	446	CB	LYS	A	60	−14.661	5.954	−26.144	1.00	16.44
ATOM	447	CG	LYS	A	60	−15.626	5.363	−25.059	1.00	17.65
ATOM	448	CD	LYS	A	60	−16.174	3.992	−25.433	1.00	18.35
ATOM	449	CE	LYS	A	60	−16.738	3.234	−24.199	1.00	19.79
ATOM	450	NZ	LYS	A	60	−17.819	3.976	−23.512	1.00	18.40
ATOM	451	C	LYS	A	60	−16.577	6.779	−27.579	1.00	16.72
ATOM	452	O	LYS	A	60	−17.663	6.182	−27.681	1.00	17.08
ATOM	453	N	ASN	A	61	−16.487	8.101	−27.508	1.00	16.77
ATOM	454	CA	ASN	A	61	−17.680	8.948	−27.628	1.00	18.06
ATOM	455	CB	ASN	A	61	−17.278	10.424	−27.573	1.00	19.41
ATOM	456	CG	ASN	A	61	−18.465	11.375	−27.643	1.00	22.93
ATOM	457	OD1	ASN	A	61	−19.585	11.057	−27.231	1.00	30.05
ATOM	458	ND2	ASN	A	61	−18.206	12.568	−28.130	1.00	29.54
ATOM	459	C	ASN	A	61	−18.480	8.659	−28.907	1.00	17.28
ATOM	460	O	ASN	A	61	−19.697	8.475	−28.852	1.00	18.11
ATOM	461	N	LEU	A	62	−17.799	8.647	−30.056	1.00	16.54
ATOM	462	CA	LEU	A	62	−18.460	8.379	−31.334	1.00	16.19
ATOM	463	CB	LEU	A	62	−17.479	8.572	−32.499	1.00	16.85
ATOM	464	CG	LEU	A	62	−17.047	10.027	−32.697	1.00	18.47
ATOM	465	CD1	LEU	A	62	−16.118	10.153	−33.916	1.00	20.38
ATOM	466	CD2	LEU	A	62	−18.263	10.925	−32.837	1.00	19.93
ATOM	467	C	LEU	A	62	−19.089	6.991	−31.371	1.00	16.01
ATOM	468	O	LEU	A	62	−20.225	6.833	−31.842	1.00	15.98
ATOM	469	N	ILE	A	63	−18.387	5.998	−30.831	1.00	15.67
ATOM	470	CA	ILE	A	63	−18.910	4.628	−30.810	1.00	15.86
ATOM	471	CB	ILE	A	63	−17.803	3.610	−30.372	1.00	15.88
ATOM	472	CG1	ILE	A	63	−16.756	3.466	−31.478	1.00	14.98
ATOM	473	CD1	ILE	A	63	−15.375	2.976	−30.966	1.00	15.62
ATOM	474	CG2	ILE	A	63	−18.398	2.251	−30.016	1.00	15.96
ATOM	475	C	ILE	A	63	−20.156	4.538	−29.920	1.00	16.39
ATOM	476	O	ILE	A	63	−21.137	3.854	−30.272	1.00	16.90
ATOM	477	N	ASP	A	64	−20.129	5.242	−28.796	1.00	16.51
ATOM	478	CA	ASP	A	64	−21.299	5.324	−27.922	1.00	17.76

TABLE 15-continued

ATOM	479	CB	ASP	A	64	−20.953	6.022	−26.594	1.00	17.81
ATOM	480	CG	ASP	A	64	−20.089	5.164	−25.682	1.00	17.84
ATOM	481	OD1	ASP	A	64	−19.883	3.944	−25.963	1.00	18.57
ATOM	482	OD2	ASP	A	64	−19.595	5.699	−24.659	1.00	20.95
ATOM	483	C	ASP	A	64	−22.492	5.982	−28.617	1.00	18.64
ATOM	484	O	ASP	A	64	−23.617	5.493	−28.507	1.00	20.85
ATOM	485	N	ARG	A	65	−22.262	7.070	−29.348	1.00	19.57
ATOM	486	CA	ARG	A	65	−23.341	7.750	−30.097	1.00	20.59
ATOM	487	CB	ARG	A	65	−22.823	9.046	−30.733	1.00	20.62
ATOM	488	CG	ARG	A	65	−22.465	10.083	−29.693	1.00	25.00
ATOM	489	CD	ARG	A	65	−22.010	11.385	−30.324	1.00	28.44
ATOM	490	NE	ARG	A	65	−23.106	12.071	−30.990	1.00	31.14
ATOM	491	CZ	ARG	A	65	−23.968	12.878	−30.373	1.00	32.75
ATOM	492	NH1	ARG	A	65	−23.873	13.095	−29.060	1.00	32.10
ATOM	493	NH2	ARG	A	65	−24.928	13.459	−31.080	1.00	32.31
ATOM	494	C	ARG	A	65	−23.907	6.841	−31.184	1.00	20.83
ATOM	495	O	ARG	A	65	−25.129	6.711	−31.357	1.00	20.48
ATOM	496	N	PHE	A	66	−22.998	6.213	−31.910	1.00	20.52
ATOM	497	CA	PHE	A	66	−23.340	5.271	−32.966	1.00	21.42
ATOM	498	CB	PHE	A	66	−22.046	4.778	−33.604	1.00	21.97
ATOM	499	CG	PHE	A	66	−22.224	3.603	−34.520	1.00	21.97
ATOM	500	CD1	PHE	A	66	−22.601	3.791	−35.844	1.00	23.23
ATOM	501	CE1	PHE	A	66	−22.768	2.690	−36.699	1.00	22.87
ATOM	502	CZ	PHE	A	66	−22.552	1.409	−36.221	1.00	22.60
ATOM	503	CE2	PHE	A	66	−22.165	1.216	−34.895	1.00	23.74
ATOM	504	CD2	PHE	A	66	−22.006	2.309	−34.054	1.00	23.07
ATOM	505	C	PHE	A	66	−24.152	4.084	−32.415	1.00	21.98
ATOM	506	O	PHE	A	66	−25.040	3.551	−33.099	1.00	21.80
ATOM	507	N	THR	A	67	−23.831	3.654	−31.195	1.00	22.48
ATOM	508	CA	THR	A	67	−24.546	2.537	−30.576	1.00	23.79
ATOM	509	CB	THR	A	67	−23.809	1.999	−29.333	1.00	23.68
ATOM	510	OG1	THR	A	67	−22.551	1.439	−29.745	1.00	23.93
ATOM	511	CG2	THR	A	67	−24.613	0.881	−28.653	1.00	23.90
ATOM	512	C	THR	A	67	−25.992	2.925	−30.258	1.00	24.77
ATOM	513	O	THR	A	67	−26.893	2.090	−30.349	1.00	25.31
ATOM	514	N	GLU	A	68	−26.207	4.189	−29.916	1.00	25.62
ATOM	515	CA	GLU	A	68	−27.540	4.688	−29.616	1.00	27.41
ATOM	516	CB	GLU	A	68	−27.466	6.038	−28.894	1.00	28.13
ATOM	517	CG	GLU	A	68	−26.997	5.951	−27.446	1.00	32.86
ATOM	518	CD	GLU	A	68	−28.095	5.487	−26.468	1.00	38.33
ATOM	519	OE1	GLU	A	68	−29.241	5.982	−26.542	1.00	40.42
ATOM	520	OE2	GLU	A	68	−27.799	4.633	−25.607	1.00	42.48
ATOM	521	C	GLU	A	68	−28.418	4.784	−30.873	1.00	27.86
ATOM	522	O	GLU	A	68	−29.602	4.429	−30.845	1.00	28.00
ATOM	523	N	THR	A	69	−27.833	5.260	−31.968	1.00	27.32
ATOM	524	CA	THR	A	69	−28.540	5.373	−33.241	1.00	27.32
ATOM	525	CB	THR	A	69	−29.113	6.792	−33.451	1.00	27.49
ATOM	526	OG1	THR	A	69	−29.922	7.153	−32.334	1.00	30.86
ATOM	527	CG2	THR	A	69	−29.945	6.843	−34.719	1.00	29.06
ATOM	528	C	THR	A	69	−27.563	5.133	−34.359	1.00	26.07
ATOM	529	O	THR	A	69	−26.619	5.905	−34.523	1.00	25.25
ATOM	530	N	TYR	A	70	−27.790	4.064	−35.123	1.00	25.65
ATOM	531	CA	TYR	A	70	−26.948	3.738	−36.267	1.00	25.36
ATOM	532	CB	TYR	A	70	−27.480	2.504	−37.013	1.00	25.26
ATOM	533	CG	TYR	A	70	−26.638	2.104	−38.217	1.00	25.62
ATOM	534	CD1	TYR	A	70	−26.949	2.567	−39.498	1.00	25.62
ATOM	535	CE1	TYR	A	70	−26.190	2.201	−40.611	1.00	26.48
ATOM	536	CZ	TYR	A	70	−25.099	1.360	−40.437	1.00	25.36
ATOM	537	OH	TYR	A	70	−24.354	0.995	−41.520	1.00	24.80
ATOM	538	CE2	TYR	A	70	−24.770	0.883	−39.175	1.00	25.59
ATOM	539	CD2	TYR	A	70	−25.538	1.259	−38.071	1.00	25.36
ATOM	540	C	TYR	A	70	−26.816	4.909	−37.230	1.00	25.38
ATOM	541	O	TYR	A	70	−27.802	5.573	−37.583	1.00	24.87
ATOM	542	N	ASP	A	71	−25.575	5.127	−37.666	1.00	25.16
ATOM	543	CA	ASP	A	71	−25.188	6.210	−38.550	1.00	25.40
ATOM	544	CB	ASP	A	71	−24.668	7.404	−37.724	1.00	25.60
ATOM	545	CG	ASP	A	71	−24.361	8.642	−38.573	1.00	26.17
ATOM	546	OD1	ASP	A	71	−23.801	8.526	−39.681	1.00	25.82
ATOM	547	OD2	ASP	A	71	−24.675	9.755	−38.108	1.00	27.85
ATOM	548	C	ASP	A	71	−24.061	5.619	−39.386	1.00	25.64
ATOM	549	O	ASP	A	71	−22.956	5.377	−38.875	1.00	24.82
ATOM	550	N	ALA	A	72	−24.347	5.379	−40.665	1.00	24.95
ATOM	551	CA	ALA	A	72	−23.380	4.764	−41.586	1.00	24.24
ATOM	552	CB	ALA	A	72	−24.047	4.434	−42.921	1.00	24.35
ATOM	553	C	ALA	A	72	−22.152	5.657	−41.812	1.00	24.04
ATOM	554	O	ALA	A	72	−21.054	5.159	−42.086	1.00	23.21
ATOM	555	N	GLY	A	73	−22.356	6.970	−41.695	1.00	23.63
ATOM	556	CA	GLY	A	73	−21.265	7.938	−41.761	1.00	24.20
ATOM	557	C	GLY	A	73	−20.285	7.809	−40.596	1.00	23.85
ATOM	558	O	GLY	A	73	−19.067	7.927	−40.806	1.00	24.81

TABLE 15-continued

ATOM	559	N	LEU	A	74	−20.798	7.588	−39.376	1.00	22.78
ATOM	560	CA	LEU	A	74	−19.927	7.347	−38.232	1.00	22.21
ATOM	561	CB	LEU	A	74	−20.662	7.449	−36.879	1.00	22.58
ATOM	562	CG	LEU	A	74	−21.132	8.846	−36.434	1.00	24.06
ATOM	563	CD1	LEU	A	74	−21.732	8.793	−35.019	1.00	22.31
ATOM	564	CD2	LEU	A	74	−20.002	9.869	−36.503	1.00	26.04
ATOM	565	C	LEU	A	74	−19.256	5.999	−38.370	1.00	21.94
ATOM	566	O	LEU	A	74	−18.060	5.872	−38.098	1.00	20.62
ATOM	567	N	GLN	A	75	−20.019	4.988	−38.814	1.00	21.47
ATOM	568	CA	GLN	A	75	−19.451	3.654	−38.989	1.00	21.07
ATOM	569	CB	GLN	A	75	−20.469	2.709	−39.619	1.00	21.44
ATOM	570	CG	GLN	A	75	−20.002	1.280	−39.594	1.00	23.11
ATOM	571	CD	GLN	A	75	−21.101	0.312	−39.945	1.00	24.74
ATOM	572	OE1	GLN	A	75	−21.273	−0.719	−39.290	1.00	26.57
ATOM	573	NE2	GLN	A	75	−21.872	0.654	−40.950	1.00	23.71
ATOM	574	C	GLN	A	75	−18.219	3.704	−39.889	1.00	21.05
ATOM	575	O	GLN	A	75	−17.229	3.046	−39.611	1.00	21.10
ATOM	576	N	ARG	A	76	−18.294	4.466	−40.975	1.00	20.73
ATOM	577	CA	ARG	A	76	−17.184	4.551	−41.910	1.00	21.56
ATOM	578	CB	ARG	A	76	−17.544	5.460	−43.101	1.00	22.06
ATOM	579	CG	ARG	A	76	−16.452	5.627	−44.168	1.00	24.00
ATOM	580	CD	ARG	A	76	−15.586	6.895	−43.934	1.00	27.60
ATOM	581	NE	ARG	A	76	−16.275	8.150	−44.280	1.00	30.93
ATOM	582	CZ	ARG	A	76	−15.778	9.378	−44.082	1.00	32.20
ATOM	583	NH1	ARG	A	76	−14.572	9.556	−43.535	1.00	30.72
ATOM	584	NH2	ARG	A	76	−16.491	10.443	−44.437	1.00	32.29
ATOM	585	C	ARG	A	76	−15.942	5.063	−41.162	1.00	20.85
ATOM	586	O	ARG	A	76	−14.858	4.514	−41.296	1.00	20.93
ATOM	587	N	ARG	A	77	−16.116	6.119	−40.378	1.00	20.17
ATOM	588	CA	ARG	A	77	−14.990	6.723	−39.631	1.00	19.61
ATOM	589	CB	ARG	A	77	−15.419	8.058	−39.009	1.00	19.11
ATOM	590	CG	ARG	A	77	−15.719	9.106	−40.075	1.00	20.18
ATOM	591	CD	ARG	A	77	−16.379	10.299	−39.459	1.00	22.42
ATOM	592	NE	ARG	A	77	−16.489	11.411	−40.396	1.00	24.06
ATOM	593	CZ	ARG	A	77	−17.501	11.592	−41.243	1.00	27.81
ATOM	594	NH1	ARG	A	77	−18.508	10.714	−41.303	1.00	28.01
ATOM	595	NH2	ARG	A	77	−17.509	12.658	−42.033	1.00	27.19
ATOM	596	C	ARG	A	77	−14.425	5.789	−38.570	1.00	18.77
ATOM	597	O	ARG	A	77	−13.197	5.685	−38.411	1.00	18.64
ATOM	598	N	ILE	A	78	−15.320	5.117	−37.852	1.00	17.79
ATOM	599	CA	ILE	A	78	−14.931	4.125	−36.857	1.00	18.13
ATOM	600	CB	ILE	A	78	−16.165	3.514	−36.151	1.00	17.88
ATOM	601	CG1	ILE	A	78	−16.862	4.564	−35.282	1.00	18.78
ATOM	602	CD1	ILE	A	78	−18.274	4.154	−34.879	1.00	19.16
ATOM	603	CG2	ILE	A	78	−15.772	2.279	−35.308	1.00	18.15
ATOM	604	C	ILE	A	78	−14.105	3.012	−37.491	1.00	18.09
ATOM	605	O	ILE	A	78	−13.088	2.612	−36.949	1.00	17.42
ATOM	606	N	GLU	A	79	−14.565	2.495	−38.631	1.00	18.82
ATOM	607	CA	GLU	A	79	−13.826	1.446	−39.341	1.00	20.22
ATOM	608	CB	GLU	A	79	−14.587	1.017	−40.609	1.00	20.36
ATOM	609	CG	GLU	A	79	−15.811	0.136	−40.312	1.00	22.29
ATOM	610	CD	GLU	A	79	−16.633	−0.206	−41.565	1.00	22.92
ATOM	611	OE1	GLU	A	79	−16.345	0.328	−42.670	1.00	26.99
ATOM	612	OE2	GLU	A	79	−17.579	−1.012	−41.425	1.00	25.69
ATOM	613	C	GLU	A	79	−12.418	1.918	−39.704	1.00	18.80
ATOM	614	O	GLU	A	79	−11.450	1.191	−39.507	1.00	19.44
ATOM	615	N	GLN	A	80	−12.301	3.147	−40.211	1.00	18.84
ATOM	616	CA	GLN	A	80	−10.998	3.661	−40.636	1.00	17.90
ATOM	617	CB	GLN	A	80	−11.149	4.921	−41.482	1.00	18.92
ATOM	618	CG	GLN	A	80	−11.794	4.593	−42.844	1.00	21.99
ATOM	619	CD	GLN	A	80	−12.040	5.799	−43.707	1.00	27.48
ATOM	620	OE1	GLN	A	80	−12.265	6.898	−43.223	1.00	30.45
ATOM	621	NE2	GLN	A	80	−12.037	5.586	−45.013	1.00	32.63
ATOM	622	C	GLN	A	80	−10.059	3.892	−39.456	1.00	17.64
ATOM	623	O	GLN	A	80	−8.862	3.612	−39.535	1.00	17.21
ATOM	624	N	TYR	A	81	−10.607	4.408	−38.365	1.00	17.29
ATOM	625	CA	TYR	A	81	−9.839	4.552	−37.122	1.00	17.64
ATOM	626	CB	TYR	A	81	−10.750	5.139	−36.023	1.00	17.24
ATOM	627	CG	TYR	A	81	−10.188	4.973	−34.621	1.00	17.79
ATOM	628	CD1	TYR	A	81	−9.085	5.728	−34.184	1.00	16.36
ATOM	629	CE1	TYR	A	81	−8.561	5.568	−32.882	1.00	17.45
ATOM	630	CZ	TYR	A	81	−9.146	4.646	−32.009	1.00	16.35
ATOM	631	OH	TYR	A	81	−8.654	4.457	−30.724	1.00	17.06
ATOM	632	CE2	TYR	A	81	−10.238	3.890	−32.423	1.00	17.51
ATOM	633	CD2	TYR	A	81	−10.754	4.055	−33.729	1.00	17.00
ATOM	634	C	TYR	A	81	−9.271	3.197	−36.686	1.00	18.04
ATOM	635	O	TYR	A	81	−8.098	3.083	−36.321	1.00	17.85
ATOM	636	N	ILE	A	82	−10.096	2.159	−36.746	1.00	17.99
ATOM	637	CA	ILE	A	82	−9.661	0.839	−36.295	1.00	19.35
ATOM	638	CB	ILE	A	82	−10.844	−0.166	−36.187	1.00	18.93

TABLE 15-continued

ATOM	639	CG1	ILE	A	82	−11.753	0.233	−35.017	1.00	19.40
ATOM	640	CD1	ILE	A	82	−13.093	−0.565	−34.896	1.00	20.46
ATOM	641	CG2	ILE	A	82	−10.301	−1.587	−35.984	1.00	20.61
ATOM	642	C	ILE	A	82	−8.547	0.292	−37.194	1.00	19.92
ATOM	643	O	ILE	A	82	−7.543	−0.239	−36.708	1.00	20.26
ATOM	644	N	THR	A	83	−8.713	0.432	−38.503	1.00	20.05
ATOM	645	CA	THR	A	83	−7.709	−0.100	−39.406	1.00	21.11
ATOM	646	CB	THR	A	83	−8.241	−0.297	−40.845	1.00	21.63
ATOM	647	OG1	THR	A	83	−8.830	0.902	−41.306	1.00	25.88
ATOM	648	CG2	THR	A	83	−9.330	−1.347	−40.851	1.00	21.56
ATOM	649	C	THR	A	83	−6.410	0.690	−39.337	1.00	20.59
ATOM	650	O	THR	A	83	−5.338	0.105	−39.511	1.00	20.72
ATOM	651	N	ALA	A	84	−6.494	1.997	−39.050	1.00	19.51
ATOM	652	CA	ALA	A	84	−5.292	2.809	−38.777	1.00	19.37
ATOM	653	CB	ALA	A	84	−5.652	4.290	−38.507	1.00	19.42
ATOM	654	C	ALA	A	84	−4.436	2.231	−37.643	1.00	19.32
ATOM	655	O	ALA	A	84	−3.208	2.370	−37.649	1.00	19.47
ATOM	656	N	GLN	A	85	−5.063	1.535	−36.695	1.00	19.34
ATOM	657	CA	GLN	A	85	−4.325	0.998	−35.544	1.00	18.78
ATOM	658	CB	GLN	A	85	−5.266	0.609	−34.396	1.00	19.29
ATOM	659	CG	GLN	A	85	−6.260	1.735	−34.007	1.00	17.98
ATOM	660	CD	GLN	A	85	−5.593	3.098	−33.830	1.00	17.20
ATOM	661	OE1	GLN	A	85	−6.021	4.095	−34.418	1.00	20.82
ATOM	662	NE2	GLN	A	85	−4.540	3.143	−33.034	1.00	13.47
ATOM	663	C	GLN	A	85	−3.447	−0.178	−35.932	1.00	19.08
ATOM	664	O	GLN	A	85	−2.478	−0.473	−35.251	1.00	17.94
ATOM	665	N	VAL	A	86	−3.808	−0.838	−37.032	1.00	19.32
ATOM	666	CA	VAL	A	86	−2.999	−1.928	−37.588	1.00	20.79
ATOM	667	CB	VAL	A	86	−3.670	−2.581	−38.823	1.00	21.18
ATOM	668	CG1	VAL	A	86	−2.712	−3.615	−39.454	1.00	22.66
ATOM	669	CG2	VAL	A	86	−4.980	−3.250	−38.400	1.00	21.47
ATOM	670	C	VAL	A	86	−1.617	−1.381	−37.940	1.00	20.63
ATOM	671	O	VAL	A	86	−0.602	−1.930	−37.520	1.00	21.41
ATOM	672	N	THR	A	87	−1.604	−0.251	−38.641	1.00	20.67
ATOM	673	CA	THR	A	87	−0.361	0.419	−39.015	1.00	21.10
ATOM	674	CB	THR	A	87	−0.659	1.583	−39.986	1.00	21.59
ATOM	675	OG1	THR	A	87	−1.176	1.033	−41.202	1.00	23.63
ATOM	676	CG2	THR	A	87	0.585	2.370	−40.305	1.00	22.02
ATOM	677	C	THR	A	87	0.412	0.881	−37.795	1.00	20.28
ATOM	678	O	THR	A	87	1.620	0.641	−37.679	1.00	20.22
ATOM	679	N	LEU	A	88	−0.280	1.543	−36.874	1.00	19.11
ATOM	680	CA	LEU	A	88	0.367	2.097	−35.697	1.00	18.71
ATOM	681	CB	LEU	A	88	−0.585	3.015	−34.903	1.00	18.08
ATOM	682	CG	LEU	A	88	−1.016	4.294	−35.596	1.00	18.50
ATOM	683	CD1	LEU	A	88	−2.038	5.058	−34.706	1.00	19.12
ATOM	684	CD2	LEU	A	88	0.206	5.193	−35.937	1.00	19.81
ATOM	685	C	LEU	A	88	0.976	1.057	−34.780	1.00	18.33
ATOM	686	O	LEU	A	88	2.101	1.244	−34.336	1.00	18.76
ATOM	687	N	GLN	A	89	0.255	−0.029	−34.492	1.00	18.75
ATOM	688	CA	GLN	A	89	0.809	−1.085	−33.623	1.00	19.67
ATOM	689	CB	GLN	A	89	−0.199	−2.201	−33.373	1.00	19.69
ATOM	690	CG	GLN	A	89	−1.397	−1.775	−32.564	1.00	19.25
ATOM	691	CD	GLN	A	89	−2.140	−2.951	−32.004	1.00	20.83
ATOM	692	OE1	GLN	A	89	−2.121	−4.037	−32.580	1.00	19.26
ATOM	693	NE2	GLN	A	89	−2.802	−2.751	−30.861	1.00	19.61
ATOM	694	C	GLN	A	89	2.097	−1.683	−34.203	1.00	20.68
ATOM	695	O	GLN	A	89	3.013	−2.026	−33.461	1.00	21.21
ATOM	696	N	GLY	A	90	2.164	−1.778	−35.524	1.00	21.75
ATOM	697	CA	GLY	A	90	3.330	−2.374	−36.173	1.00	23.35
ATOM	698	C	GLY	A	90	4.604	−1.552	−36.096	1.00	24.79
ATOM	699	O	GLY	A	90	5.699	−2.104	−36.299	1.00	25.52
ATOM	700	N	ASN	A	91	4.477	−0.252	−35.796	1.00	25.17
ATOM	701	CA	ASN	A	91	5.596	0.714	−35.870	1.00	26.14
ATOM	702	CB	ASN	A	91	5.108	2.161	−35.653	1.00	26.83
ATOM	703	CG	ASN	A	91	4.615	2.849	−36.919	1.00	29.67
ATOM	704	OD1	ASN	A	91	4.869	2.414	−38.051	1.00	34.53
ATOM	705	ND2	ASN	A	91	3.927	3.981	−36.724	1.00	32.76
ATOM	706	C	ASN	A	91	6.656	0.489	−34.820	1.00	25.67
ATOM	707	O	ASN	A	91	6.346	0.385	−33.644	1.00	25.70
ATOM	708	N	SER	A	92	7.918	0.472	−35.227	1.00	25.32
ATOM	709	CA	SER	A	92	8.990	0.668	−34.257	1.00	25.27
ATOM	710	CB	SER	A	92	10.314	0.107	−34.775	1.00	26.03
ATOM	711	OG	SER	A	92	10.212	−1.305	−34.803	1.00	30.67
ATOM	712	C	SER	A	92	9.103	2.171	−34.003	1.00	23.80
ATOM	713	O	SER	A	92	9.055	2.979	−34.942	1.00	24.56
ATOM	714	N	ASN	A	93	9.246	2.544	−32.743	1.00	22.30
ATOM	715	CA	ASN	A	93	9.236	3.953	−32.383	1.00	21.23
ATOM	716	CB	ASN	A	93	7.769	4.423	−32.201	1.00	21.41
ATOM	717	CG	ASN	A	93	7.075	3.704	−31.051	1.00	19.23
ATOM	718	OD1	ASN	A	93	7.564	3.736	−29.927	1.00	17.81

TABLE 15-continued

ATOM	719	ND2	ASN	A	93	5.974	3.024	−31.335	1.00	19.43
ATOM	720	C	ASN	A	93	10.103	4.149	−31.150	1.00	20.39
ATOM	721	O	ASN	A	93	10.625	3.154	−30.607	1.00	19.46
ATOM	722	N	PRO	A	94	10.337	5.410	−30.732	1.00	19.95
ATOM	723	CA	PRO	A	94	11.228	5.604	−29.574	1.00	19.89
ATOM	724	CB	PRO	A	94	11.235	7.131	−29.385	1.00	19.51
ATOM	725	CG	PRO	A	94	10.988	7.653	−30.753	1.00	19.96
ATOM	726	CD	PRO	A	94	9.952	6.717	−31.325	1.00	19.99
ATOM	727	C	PRO	A	94	10.870	4.898	−28.263	1.00	20.64
ATOM	728	O	PRO	A	94	11.756	4.727	−27.430	1.00	20.54
ATOM	729	N	SER	A	95	9.610	4.485	−28.073	1.00	20.36
ATOM	730	CA	SER	A	95	9.264	3.674	−26.902	1.00	21.00
ATOM	731	CB	SER	A	95	7.770	3.736	−26.587	1.00	20.05
ATOM	732	OG	SER	A	95	7.413	5.036	−26.147	1.00	19.97
ATOM	733	C	SER	A	95	9.679	2.204	−27.066	1.00	21.73
ATOM	734	O	SER	A	95	9.809	1.499	−26.072	1.00	22.10
ATOM	735	N	GLY	A	96	9.853	1.748	−28.306	1.00	21.90
ATOM	736	CA	GLY	A	96	10.229	0.350	−28.562	1.00	23.56
ATOM	737	C	GLY	A	96	9.506	−0.196	−29.774	1.00	24.14
ATOM	738	O	GLY	A	96	9.121	0.557	−30.664	1.00	24.24
ATOM	739	N	SER	A	97	9.315	−1.510	−29.828	1.00	25.24
ATOM	740	CA	SER	A	97	8.703	−2.116	−31.000	1.00	25.77
ATOM	741	CB	SER	A	97	9.751	−2.874	−31.834	1.00	27.15
ATOM	742	OG	SER	A	97	10.120	−4.086	−31.189	1.00	30.57
ATOM	743	C	SER	A	97	7.590	−3.042	−30.571	1.00	25.27
ATOM	744	O	SER	A	97	7.346	−3.199	−29.376	1.00	24.85
ATOM	745	N	LEU	A	98	6.930	−3.655	−31.543	1.00	24.82
ATOM	746	CA	LEU	A	98	5.826	−4.559	−31.252	1.00	25.88
ATOM	747	CB	LEU	A	98	4.982	−4.813	−32.504	1.00	25.31
ATOM	748	CG	LEU	A	98	3.714	−5.673	−32.420	1.00	25.89
ATOM	749	CD1	LEU	A	98	2.745	−5.169	−31.337	1.00	25.58
ATOM	750	CD2	LEU	A	98	3.006	−5.724	−33.778	1.00	26.27
ATOM	751	C	LEU	A	98	6.310	−5.866	−30.604	1.00	26.75
ATOM	752	O	LEU	A	98	5.607	−6.438	−29.762	1.00	27.41
ATOM	753	N	ALA	A	99	7.528	−6.290	−30.950	1.00	27.23
ATOM	754	CA	ALA	A	99	8.074	−7.590	−30.533	1.00	27.89
ATOM	755	CB	ALA	A	99	9.566	−7.700	−30.935	1.00	27.68
ATOM	756	C	ALA	A	99	7.893	−7.911	−29.053	1.00	27.86
ATOM	757	O	ALA	A	99	7.450	−9.007	−28.711	1.00	28.77
ATOM	758	N	ASP	A	100	8.241	−6.966	−28.181	1.00	27.75
ATOM	759	CA	ASP	A	100	8.030	−7.137	−26.741	1.00	27.20
ATOM	760	CB	ASP	A	100	9.328	−6.937	−25.966	1.00	27.10
ATOM	761	CG	ASP	A	100	9.845	−5.525	−26.038	1.00	30.19
ATOM	762	OD1	ASP	A	100	10.891	−5.281	−25.419	1.00	32.28
ATOM	763	OD2	ASP	A	100	9.225	−4.654	−26.694	1.00	30.36
ATOM	764	C	ASP	A	100	6.905	−6.256	−26.173	1.00	25.74
ATOM	765	O	ASP	A	100	6.761	−6.108	−24.956	1.00	26.33
ATOM	766	N	GLY	A	101	6.118	−5.683	−27.075	1.00	24.93
ATOM	767	CA	GLY	A	101	4.982	−4.853	−26.707	1.00	23.22
ATOM	768	C	GLY	A	101	5.326	−3.418	−26.342	1.00	22.68
ATOM	769	O	GLY	A	101	4.419	−2.580	−26.287	1.00	21.48
ATOM	770	N	SER	A	102	6.609	−3.117	−26.126	1.00	21.53
ATOM	771	CA	SER	A	102	6.996	−1.815	−25.563	1.00	21.49
ATOM	772	CB	SER	A	102	8.483	−1.739	−25.199	1.00	22.07
ATOM	773	OG	SER	A	102	9.283	−1.958	−26.345	1.00	21.77
ATOM	774	C	SER	A	102	6.604	−0.643	−26.449	1.00	20.66
ATOM	775	O	SER	A	102	6.279	0.403	−25.925	1.00	20.67
ATOM	776	N	GLY	A	103	6.636	−0.819	−27.771	1.00	19.97
ATOM	777	CA	GLY	A	103	6.257	0.255	−28.707	1.00	19.46
ATOM	778	C	GLY	A	103	4.824	0.777	−28.539	1.00	18.94
ATOM	779	O	GLY	A	103	4.525	1.903	−28.945	1.00	18.13
ATOM	780	N	LEU	A	104	3.939	−0.043	−27.956	1.00	18.13
ATOM	781	CA	LEU	A	104	2.517	0.326	−27.818	1.00	16.92
ATOM	782	CB	LEU	A	104	1.672	−0.924	−27.447	1.00	17.28
ATOM	783	CG	LEU	A	104	1.715	−2.104	−28.430	1.00	16.76
ATOM	784	CD1	LEU	A	104	1.072	−3.356	−27.836	1.00	21.62
ATOM	785	CD2	LEU	A	104	1.069	−1.751	−29.761	1.00	19.06
ATOM	786	C	LEU	A	104	2.283	1.464	−26.798	1.00	16.57
ATOM	787	O	LEU	A	104	1.202	2.092	−26.807	1.00	16.79
ATOM	788	N	GLY	A	105	3.279	1.713	−25.936	1.00	14.86
ATOM	789	CA	GLY	A	105	3.255	2.802	−24.938	1.00	15.94
ATOM	790	C	GLY	A	105	3.558	4.199	−25.482	1.00	15.05
ATOM	791	O	GLY	A	105	3.481	5.179	−24.755	1.00	15.93
ATOM	792	N	GLU	A	106	3.869	4.292	−26.780	1.00	14.63
ATOM	793	CA	GLU	A	106	4.236	5.548	−27.416	1.00	14.49
ATOM	794	CB	GLU	A	106	4.728	5.250	−28.847	1.00	13.83
ATOM	795	CG	GLU	A	106	5.215	6.470	−29.678	1.00	16.14
ATOM	796	CD	GLU	A	106	6.479	7.155	−29.139	1.00	18.44
ATOM	797	OE1	GLU	A	106	6.978	6.817	−28.044	1.00	21.44
ATOM	798	OE2	GLU	A	106	6.972	8.083	−29.817	1.00	21.04

TABLE 15-continued

ATOM	799	C	GLU	A	106	3.012	6.484	−27.413	1.00	14.32
ATOM	800	O	GLU	A	106	1.928	6.074	−27.828	1.00	15.51
ATOM	801	N	PRO	A	107	3.164	7.706	−26.890	1.00	15.21
ATOM	802	CA	PRO	A	107	2.025	8.645	−26.772	1.00	14.90
ATOM	803	CB	PRO	A	107	2.598	9.809	−25.951	1.00	15.27
ATOM	804	CG	PRO	A	107	3.833	9.290	−25.310	1.00	17.25
ATOM	805	CD	PRO	A	107	4.385	8.238	−26.243	1.00	14.35
ATOM	806	C	PRO	A	107	1.468	9.219	−28.066	1.00	14.48
ATOM	807	O	PRO	A	107	0.263	9.371	−28.172	1.00	13.94
ATOM	808	N	LYS	A	108	2.320	9.567	−29.027	1.00	14.24
ATOM	809	CA	LYS	A	108	1.837	10.309	−30.204	1.00	14.51
ATOM	810	CB	LYS	A	108	1.853	11.828	−29.960	1.00	14.26
ATOM	811	CG	LYS	A	108	3.225	12.524	−30.029	1.00	13.88
ATOM	812	CD	LYS	A	108	3.102	14.033	−29.775	1.00	15.15
ATOM	813	CE	LYS	A	108	4.299	14.820	−30.283	1.00	17.08
ATOM	814	NZ	LYS	A	108	4.341	16.279	−29.836	1.00	15.57
ATOM	815	C	LYS	A	108	2.608	9.953	−31.454	1.00	14.69
ATOM	816	O	LYS	A	108	3.734	9.442	−31.377	1.00	14.67
ATOM	817	N	PHE	A	109	1.976	10.203	−32.594	1.00	14.54
ATOM	818	CA	PHE	A	109	2.530	9.860	−33.902	1.00	15.20
ATOM	819	CB	PHE	A	109	1.839	8.594	−34.451	1.00	15.67
ATOM	820	CG	PHE	A	109	1.973	7.407	−33.553	1.00	16.81
ATOM	821	CD1	PHE	A	109	1.081	7.219	−32.490	1.00	17.93
ATOM	822	CE1	PHE	A	109	1.205	6.117	−31.649	1.00	21.93
ATOM	823	CZ	PHE	A	109	2.241	5.210	−31.834	1.00	19.06
ATOM	824	CE2	PHE	A	109	3.141	5.384	−32.883	1.00	20.27
ATOM	825	CD2	PHE	A	109	3.003	6.492	−33.737	1.00	19.44
ATOM	826	C	PHE	A	109	2.301	10.992	−34.881	1.00	15.19
ATOM	827	O	PHE	A	109	1.450	11.861	−34.655	1.00	14.41
ATOM	828	N	GLU	A	110	3.039	10.971	−35.993	1.00	15.14
ATOM	829	CA	GLU	A	110	2.756	11.905	−37.077	1.00	15.24
ATOM	830	CB	GLU	A	110	3.905	11.933	−38.103	1.00	15.00
ATOM	831	CG	GLU	A	110	5.302	12.204	−37.493	1.00	16.29
ATOM	832	CD	GLU	A	110	5.554	13.673	−37.174	1.00	17.52
ATOM	833	OE1	GLU	A	110	4.708	14.544	−37.504	1.00	17.65
ATOM	834	OE2	GLU	A	110	6.619	13.963	−36.587	1.00	18.74
ATOM	835	C	GLU	A	110	1.462	11.476	−37.762	1.00	15.32
ATOM	836	O	GLU	A	110	1.093	10.278	−37.753	1.00	15.26
ATOM	837	N	LEU	A	111	0.776	12.445	−38.360	1.00	15.59
ATOM	838	CA	LEU	A	111	−0.522	12.186	−39.009	1.00	16.33
ATOM	839	CB	LEU	A	111	−1.265	13.510	−39.163	1.00	16.57
ATOM	840	CG	LEU	A	111	−1.770	13.908	−37.756	1.00	18.11
ATOM	841	CD1	LEU	A	111	−1.819	15.405	−37.574	1.00	21.43
ATOM	842	CD2	LEU	A	111	−3.151	13.204	−37.506	1.00	18.74
ATOM	843	C	LEU	A	111	−0.409	11.436	−40.350	1.00	17.37
ATOM	844	O	LEU	A	111	−1.426	11.023	−40.944	1.00	17.23
ATOM	845	N	THR	A	112	0.833	11.258	−40.815	1.00	17.42
ATOM	846	CA	THR	A	112	1.144	10.301	−41.887	1.00	17.92
ATOM	847	CB	THR	A	112	2.512	10.619	−42.499	1.00	17.98
ATOM	848	OG1	THR	A	112	3.476	10.702	−41.445	1.00	18.32
ATOM	849	CG2	THR	A	112	2.486	11.945	−43.228	1.00	19.47
ATOM	850	C	THR	A	112	1.215	8.846	−41.356	1.00	18.90
ATOM	851	O	THR	A	112	1.535	7.917	−42.117	1.00	17.68
ATOM	852	N	LEU	A	113	0.944	8.664	−40.055	1.00	18.48
ATOM	853	CA	LEU	A	113	1.041	7.379	−39.348	1.00	19.78
ATOM	854	CB	LEU	A	113	0.061	6.319	−39.904	1.00	19.45
ATOM	855	CG	LEU	A	113	−1.411	6.699	−40.074	1.00	21.71
ATOM	856	CD1	LEU	A	113	−2.194	5.470	−40.477	1.00	23.46
ATOM	857	CD2	LEU	A	113	−2.005	7.323	−38.800	1.00	21.59
ATOM	858	C	LEU	A	113	2.481	6.866	−39.338	1.00	20.43
ATOM	859	O	LEU	A	113	2.737	5.704	−39.653	1.00	20.96
ATOM	860	N	LYS	A	114	3.406	7.769	−39.024	1.00	20.07
ATOM	861	CA	LYS	A	114	4.826	7.460	−38.863	1.00	20.25
ATOM	862	CB	LYS	A	114	5.662	8.209	−39.899	1.00	20.95
ATOM	863	CG	LYS	A	114	5.432	7.725	−41.314	1.00	25.23
ATOM	864	CD	LYS	A	114	6.636	8.059	−42.184	1.00	33.76
ATOM	865	CE	LYS	A	114	6.551	7.360	−43.537	1.00	38.31
ATOM	866	NZ	LYS	A	114	5.285	7.711	−44.251	1.00	41.29
ATOM	867	C	LYS	A	114	5.252	7.874	−37.471	1.00	19.64
ATOM	868	O	LYS	A	114	4.576	8.708	−36.845	1.00	19.39
ATOM	869	N	PRO	A	115	6.376	7.318	−36.973	1.00	19.06
ATOM	870	CA	PRO	A	115	6.750	7.626	−35.601	1.00	18.72
ATOM	871	CB	PRO	A	115	7.963	6.712	−35.326	1.00	19.82
ATOM	872	CG	PRO	A	115	8.101	5.814	−36.500	1.00	20.93
ATOM	873	CD	PRO	A	115	7.339	6.412	−37.639	1.00	19.08
ATOM	874	C	PRO	A	115	7.156	9.093	−35.434	1.00	18.70
ATOM	875	O	PRO	A	115	7.694	9.724	−36.375	1.00	17.25
ATOM	876	N	PHE	A	116	6.844	9.628	−34.256	1.00	18.55
ATOM	877	CA	PHE	A	116	7.342	10.918	−33.805	1.00	18.27
ATOM	878	CB	PHE	A	116	6.359	11.566	−32.809	1.00	18.41

TABLE 15-continued

ATOM	879	CG	PHE	A	116	6.908	12.804	−32.151	1.00	17.33
ATOM	880	CD1	PHE	A	116	6.942	14.014	−32.847	1.00	16.98
ATOM	881	CE1	PHE	A	116	7.457	15.173	−32.254	1.00	16.22
ATOM	882	CZ	PHE	A	116	7.950	15.138	−30.935	1.00	15.88
ATOM	883	CE2	PHE	A	116	7.902	13.917	−30.216	1.00	16.74
ATOM	884	CD2	PHE	A	116	7.380	12.767	−30.825	1.00	16.05
ATOM	885	C	PHE	A	116	8.701	10.695	−33.141	1.00	19.14
ATOM	886	O	PHE	A	116	8.808	9.987	−32.134	1.00	19.66
ATOM	887	N	THR	A	117	9.746	11.299	−33.713	1.00	19.53
ATOM	888	CA	THR	A	117	11.116	11.020	−33.315	1.00	20.15
ATOM	889	CB	THR	A	117	12.042	10.999	−34.567	1.00	20.83
ATOM	890	OG1	THR	A	117	11.988	12.277	−35.222	1.00	22.59
ATOM	891	CG2	THR	A	117	11.576	9.895	−35.557	1.00	21.40
ATOM	892	C	THR	A	117	11.685	11.969	−32.263	1.00	20.34
ATOM	893	O	THR	A	117	12.813	11.768	−31.774	1.00	21.13
ATOM	894	N	GLY	A	118	10.943	13.017	−31.914	1.00	19.25
ATOM	895	CA	GLY	A	118	11.451	14.018	−30.974	1.00	19.41
ATOM	896	C	GLY	A	118	11.431	13.498	−29.541	1.00	19.75
ATOM	897	O	GLY	A	118	10.913	12.397	−29.281	1.00	19.99
ATOM	898	N	ASN	A	119	11.998	14.279	−28.622	1.00	19.56
ATOM	899	CA	ASN	A	119	11.958	13.954	−27.198	1.00	20.41
ATOM	900	CB	ASN	A	119	12.961	14.801	−26.419	1.00	21.50
ATOM	901	CG	ASN	A	119	14.377	14.612	−26.930	1.00	25.14
ATOM	902	OD1	ASN	A	119	14.779	13.500	−27.294	1.00	30.77
ATOM	903	ND2	ASN	A	119	15.131	15.693	−26.987	1.00	31.23
ATOM	904	C	ASN	A	119	10.550	14.194	−26.696	1.00	20.06
ATOM	905	O	ASN	A	119	9.881	15.089	−27.167	1.00	19.00
ATOM	906	N	TRP	A	120	10.084	13.348	−25.787	1.00	19.74
ATOM	907	CA	TRP	A	120	8.707	13.466	−25.316	1.00	19.03
ATOM	908	CB	TRP	A	120	7.717	12.917	−26.359	1.00	18.71
ATOM	909	CG	TRP	A	120	6.351	13.522	−26.162	1.00	19.76
ATOM	910	CD1	TRP	A	120	5.239	12.901	−25.673	1.00	19.81
ATOM	911	NE1	TRP	A	120	4.186	13.799	−25.593	1.00	19.49
ATOM	912	CE2	TRP	A	120	4.612	15.021	−26.042	1.00	19.44
ATOM	913	CD2	TRP	A	120	5.975	14.886	−26.410	1.00	19.35
ATOM	914	CE3	TRP	A	120	6.657	16.014	−26.895	1.00	18.94
ATOM	915	CZ3	TRP	A	120	5.959	17.220	−27.010	1.00	20.22
ATOM	916	CH2	TRP	A	120	4.602	17.315	−26.628	1.00	20.15
ATOM	917	CZ2	TRP	A	120	3.918	16.233	−26.160	1.00	18.83
ATOM	918	C	TRP	A	120	8.602	12.685	−24.001	1.00	18.80
ATOM	919	O	TRP	A	120	9.454	11.833	−23.722	1.00	18.83
ATOM	920	N	GLY	A	121	7.593	12.990	−23.189	1.00	17.91
ATOM	921	CA	GLY	A	121	7.314	12.189	−21.988	1.00	17.64
ATOM	922	C	GLY	A	121	6.721	10.834	−22.362	1.00	18.93
ATOM	923	O	GLY	A	121	5.499	10.704	−22.487	1.00	18.99
ATOM	924	N	ARG	A	122	7.589	9.828	−22.536	1.00	17.95
ATOM	925	CA	ARG	A	122	7.195	8.483	−22.958	1.00	17.86
ATOM	926	CB	ARG	A	122	7.686	8.193	−24.394	1.00	17.37
ATOM	927	CG	ARG	A	122	9.181	8.529	−24.626	1.00	19.53
ATOM	928	CD	ARG	A	122	9.689	7.987	−25.969	1.00	17.88
ATOM	929	NE	ARG	A	122	9.012	8.549	−27.159	1.00	18.08
ATOM	930	CZ	ARG	A	122	9.425	9.645	−27.807	1.00	18.06
ATOM	931	NH1	ARG	A	122	10.477	10.326	−27.366	1.00	16.88
ATOM	932	NH2	ARG	A	122	8.784	10.074	−28.892	1.00	17.35
ATOM	933	C	ARG	A	122	7.799	7.450	−21.976	1.00	17.48
ATOM	934	O	ARG	A	122	8.848	7.697	−21.396	1.00	17.69
ATOM	935	N	PRO	A	123	7.142	6.298	−21.781	1.00	17.14
ATOM	936	CA	PRO	A	123	5.886	5.916	−22.382	1.00	16.01
ATOM	937	CB	PRO	A	123	5.908	4.385	−22.266	1.00	16.51
ATOM	938	CG	PRO	A	123	6.585	4.144	−20.969	1.00	16.30
ATOM	939	CD	PRO	A	123	7.658	5.238	−20.873	1.00	16.95
ATOM	940	C	PRO	A	123	4.716	6.494	−21.581	1.00	15.29
ATOM	941	O	PRO	A	123	4.926	7.057	−20.521	1.00	15.07
ATOM	942	N	GLN	A	124	3.504	6.362	−22.120	1.00	14.60
ATOM	943	CA	GLN	A	124	2.289	6.675	−21.386	1.00	14.40
ATOM	944	CB	GLN	A	124	1.602	7.889	−22.001	1.00	14.71
ATOM	945	CG	GLN	A	124	2.442	9.186	−21.711	1.00	11.93
ATOM	946	CD	GLN	A	124	1.993	10.407	−22.472	1.00	15.67
ATOM	947	OE1	GLN	A	124	2.807	11.310	−22.758	1.00	15.75
ATOM	948	NE2	GLN	A	124	0.718	10.450	−22.822	1.00	9.85
ATOM	949	C	GLN	A	124	1.441	5.421	−21.511	1.00	14.28
ATOM	950	O	GLN	A	124	0.988	5.095	−22.604	1.00	14.63
ATOM	951	N	ARG	A	125	1.241	4.731	−20.390	1.00	13.50
ATOM	952	CA	ARG	A	125	0.700	3.382	−20.398	1.00	13.96
ATOM	953	CB	ARG	A	125	1.331	2.567	−19.256	1.00	14.28
ATOM	954	CG	ARG	A	125	2.864	2.703	−19.249	1.00	15.16
ATOM	955	CD	ARG	A	125	3.503	1.577	−18.439	1.00	18.07
ATOM	956	NE	ARG	A	125	4.924	1.827	−18.132	1.00	17.46
ATOM	957	CZ	ARG	A	125	5.944	1.334	−18.833	1.00	19.43
ATOM	958	NH1	ARG	A	125	5.728	0.601	−19.925	1.00	20.02

TABLE 15-continued

ATOM	959	NH2	ARG	A	125	7.197	1.596	−18.453	1.00	18.94
ATOM	960	C	ARG	A	125	−0.829	3.335	−20.359	1.00	14.48
ATOM	961	O	ARG	A	125	−1.424	2.262	−20.343	1.00	14.40
ATOM	962	N	ASP	A	126	−1.462	4.509	−20.374	1.00	14.03
ATOM	963	CA	ASP	A	126	−2.919	4.568	−20.542	1.00	13.39
ATOM	964	CB	ASP	A	126	−3.488	5.922	−20.067	1.00	13.17
ATOM	965	CG	ASP	A	126	−2.926	7.092	−20.845	1.00	14.17
ATOM	966	OD1	ASP	A	126	−1.713	7.108	−21.143	1.00	12.29
ATOM	967	OD2	ASP	A	126	−3.705	8.003	−21.187	1.00	16.69
ATOM	968	C	ASP	A	126	−3.350	4.306	−21.974	1.00	13.60
ATOM	969	O	ASP	A	126	−4.452	3.806	−22.189	1.00	13.56
ATOM	970	N	GLY	A	127	−2.491	4.634	−22.948	1.00	12.78
ATOM	971	CA	GLY	A	127	−2.886	4.558	−24.358	1.00	13.20
ATOM	972	C	GLY	A	127	−3.473	3.213	−24.794	1.00	12.77
ATOM	973	O	GLY	A	127	−4.579	3.150	−25.327	1.00	12.56
ATOM	974	N	PRO	A	128	−2.720	2.120	−24.613	1.00	13.94
ATOM	975	CA	PRO	A	128	−3.262	0.810	−24.978	1.00	12.97
ATOM	976	CB	PRO	A	128	−2.135	−0.162	−24.552	1.00	14.15
ATOM	977	CG	PRO	A	128	−0.907	0.656	−24.721	1.00	14.39
ATOM	978	CD	PRO	A	128	−1.323	2.010	−24.150	1.00	13.67
ATOM	979	C	PRO	A	128	−4.571	0.455	−24.255	1.00	13.30
ATOM	980	O	PRO	A	128	−5.433	−0.161	−24.869	1.00	13.72
ATOM	981	N	ALA	A	129	−4.718	0.852	−22.985	1.00	12.95
ATOM	982	CA	ALA	A	129	−5.963	0.611	−22.258	1.00	13.49
ATOM	983	CB	ALA	A	129	−5.806	1.016	−20.808	1.00	13.00
ATOM	984	C	ALA	A	129	−7.162	1.329	−22.923	1.00	13.43
ATOM	985	O	ALA	A	129	−8.217	0.721	−23.159	1.00	13.26
ATOM	986	N	LEU	A	130	−6.998	2.619	−23.221	1.00	12.51
ATOM	987	CA	LEU	A	130	−8.068	3.409	−23.813	1.00	12.69
ATOM	988	CB	LEU	A	130	−7.678	4.903	−23.806	1.00	12.56
ATOM	989	CG	LEU	A	130	−7.458	5.555	−22.426	1.00	14.76
ATOM	990	CD1	LEU	A	130	−6.959	6.991	−22.643	1.00	15.23
ATOM	991	CD2	LEU	A	130	−8.776	5.544	−21.651	1.00	15.30
ATOM	992	C	LEU	A	130	−8.410	2.934	−25.228	1.00	12.78
ATOM	993	O	LEU	A	130	−9.571	2.863	−25.607	1.00	12.83
ATOM	994	N	ARG	A	131	−7.386	2.601	−26.015	1.00	13.70
ATOM	995	CA	ARG	A	131	−7.630	2.070	−27.351	1.00	14.52
ATOM	996	CB	ARG	A	131	−6.316	1.925	−28.135	1.00	14.04
ATOM	997	CG	ARG	A	131	−6.550	1.438	−29.566	1.00	15.60
ATOM	998	CD	ARG	A	131	−5.278	1.522	−30.428	1.00	15.59
ATOM	999	NE	ARG	A	131	−4.118	0.915	−29.779	1.00	16.77
ATOM	1000	CZ	ARG	A	131	−2.860	1.205	−30.098	1.00	16.26
ATOM	1001	NH1	ARG	A	131	−2.610	2.104	−31.054	1.00	16.37
ATOM	1002	NH2	ARG	A	131	−1.856	0.618	−29.448	1.00	15.96
ATOM	1003	C	ARG	A	131	−8.408	0.729	−27.283	1.00	14.44
ATOM	1004	O	ARG	A	131	−9.350	0.533	−28.050	1.00	15.71
ATOM	1005	N	ALA	A	132	−8.025	−0.164	−26.364	1.00	14.50
ATOM	1006	CA	ALA	A	132	−8.738	−1.456	−26.195	1.00	15.06
ATOM	1007	CB	ALA	A	132	−8.069	−2.348	−25.112	1.00	15.02
ATOM	1008	C	ALA	A	132	−10.194	−1.197	−25.846	1.00	15.43
ATOM	1009	O	ALA	A	132	−11.101	−1.808	−26.416	1.00	15.57
ATOM	1010	N	ILE	A	133	−10.418	−0.270	−24.915	1.00	15.70
ATOM	1011	CA	ILE	A	133	−11.777	0.049	−24.491	1.00	14.44
ATOM	1012	CB	ILE	A	133	−11.775	1.056	−23.335	1.00	14.07
ATOM	1013	CG1	ILE	A	133	−11.268	0.387	−22.046	1.00	15.40
ATOM	1014	CD1	ILE	A	133	−10.751	1.388	−21.017	1.00	16.66
ATOM	1015	CG2	ILE	A	133	−13.176	1.702	−23.101	1.00	13.98
ATOM	1016	C	ILE	A	133	−12.633	0.517	−25.679	1.00	14.36
ATOM	1017	O	ILE	A	133	−13.781	0.102	−25.807	1.00	14.69
ATOM	1018	N	ALA	A	134	−12.079	1.362	−26.545	1.00	13.69
ATOM	1019	CA	ALA	A	134	−12.819	1.832	−27.720	1.00	13.81
ATOM	1020	CB	ALA	A	134	−12.019	2.949	−28.452	1.00	13.99
ATOM	1021	C	ALA	A	134	−13.140	0.662	−28.657	1.00	14.62
ATOM	1022	O	ALA	A	134	−14.279	0.473	−29.087	1.00	14.90
ATOM	1023	N	LEU	A	135	−12.133	−0.155	−28.947	1.00	14.66
ATOM	1024	CA	LEU	A	135	−12.328	−1.251	−29.901	1.00	15.75
ATOM	1025	CB	LEU	A	135	−10.984	−1.875	−30.311	1.00	15.75
ATOM	1026	CG	LEU	A	135	−10.348	−1.231	−31.557	1.00	16.40
ATOM	1027	CD1	LEU	A	135	−10.257	0.308	−31.471	1.00	18.56
ATOM	1028	CD2	LEU	A	135	−8.980	−1.852	−31.804	1.00	17.85
ATOM	1029	C	LEU	A	135	−13.277	−2.306	−29.340	1.00	15.13
ATOM	1030	O	LEU	A	135	−14.079	−2.845	−30.087	1.00	15.84
ATOM	1031	N	ILE	A	136	−13.192	−2.573	−28.039	1.00	15.22
ATOM	1032	CA	ILE	A	136	−14.153	−3.473	−27.377	1.00	15.71
ATOM	1033	CB	ILE	A	136	−13.734	−3.829	−25.918	1.00	15.92
ATOM	1034	CG1	ILE	A	136	−12.408	−4.598	−25.904	1.00	15.39
ATOM	1035	CD1	ILE	A	136	−11.742	−4.679	−24.497	1.00	15.63
ATOM	1036	CG2	ILE	A	136	−14.842	−4.611	−25.204	1.00	16.20
ATOM	1037	C	ILE	A	136	−15.565	−2.902	−27.457	1.00	17.10
ATOM	1038	O	ILE	A	136	−16.531	−3.631	−27.728	1.00	17.48

TABLE 15-continued

ATOM	1039	N	GLY	A	137	−15.685	−1.581	−27.297	1.00	16.46
ATOM	1040	CA	GLY	A	137	−16.979	−0.902	−27.484	1.00	16.59
ATOM	1041	C	GLY	A	137	−17.600	−1.206	−28.833	1.00	17.13
ATOM	1042	O	GLY	A	137	−18.778	−1.605	−28.920	1.00	16.92
ATOM	1043	N	TYR	A	138	−16.817	−1.056	−29.898	1.00	16.61
ATOM	1044	CA	TYR	A	138	−17.353	−1.349	−31.224	1.00	17.93
ATOM	1045	CB	TYR	A	138	−16.446	−0.838	−32.341	1.00	17.46
ATOM	1046	CG	TYR	A	138	−17.112	−0.897	−33.693	1.00	18.28
ATOM	1047	CD1	TYR	A	138	−18.350	−0.268	−33.914	1.00	18.85
ATOM	1048	CE1	TYR	A	138	−18.966	−0.314	−35.153	1.00	21.29
ATOM	1049	CZ	TYR	A	138	−18.358	−1.001	−36.207	1.00	20.99
ATOM	1050	OH	TYR	A	138	−18.994	−1.055	−37.433	1.00	20.06
ATOM	1051	CE2	TYR	A	138	−17.133	−1.636	−36.026	1.00	19.88
ATOM	1052	CD2	TYR	A	138	−16.512	−1.583	−34.766	1.00	18.25
ATOM	1053	C	TYR	A	138	−17.643	−2.844	−31.406	1.00	18.67
ATOM	1054	O	TYR	A	138	−18.654	−3.207	−32.037	1.00	20.06
ATOM	1055	N	SER	A	139	−16.766	−3.686	−30.864	1.00	19.48
ATOM	1056	CA	SER	A	139	−16.942	−5.146	−30.900	1.00	21.02
ATOM	1057	CB	SER	A	139	−15.808	−5.829	−30.129	1.00	21.09
ATOM	1058	OG	SER	A	139	−14.581	−5.598	−30.789	1.00	21.49
ATOM	1059	C	SER	A	139	−18.298	−5.557	−30.325	1.00	22.24
ATOM	1060	O	SER	A	139	−19.002	−6.392	−30.907	1.00	23.64
ATOM	1061	N	LYS	A	140	−18.669	−4.976	−29.188	1.00	22.77
ATOM	1062	CA	LYS	A	140	−19.987	−5.225	−28.595	1.00	24.29
ATOM	1063	CB	LYS	A	140	−20.218	−4.343	−27.370	1.00	24.29
ATOM	1064	CG	LYS	A	140	−19.384	−4.695	−26.170	1.00	26.62
ATOM	1065	CD	LYS	A	140	−19.696	−3.693	−25.060	1.00	28.24
ATOM	1066	CE	LYS	A	140	−18.589	−3.635	−24.056	1.00	28.19
ATOM	1067	NZ	LYS	A	140	−18.940	−2.725	−22.954	1.00	26.78
ATOM	1068	C	LYS	A	140	−21.126	−5.001	−29.584	1.00	24.17
ATOM	1069	O	LYS	A	140	−22.053	−5.823	−29.670	1.00	24.94
ATOM	1070	N	TRP	A	141	−21.062	−3.898	−30.321	1.00	23.60
ATOM	1071	CA	TRP	A	141	−22.054	−3.613	−31.338	1.00	24.29
ATOM	1072	CB	TRP	A	141	−21.847	−2.226	−31.953	1.00	24.36
ATOM	1073	CG	TRP	A	141	−22.973	−1.833	−32.874	1.00	24.25
ATOM	1074	CD1	TRP	A	141	−24.113	−1.170	−32.531	1.00	25.06
ATOM	1075	NE1	TRP	A	141	−24.921	−1.016	−33.638	1.00	25.22
ATOM	1076	CE2	TRP	A	141	−24.302	−1.575	−34.722	1.00	24.07
ATOM	1077	CD2	TRP	A	141	−23.078	−2.115	−34.276	1.00	24.80
ATOM	1078	CE3	TRP	A	141	−22.248	−2.766	−35.203	1.00	25.40
ATOM	1079	CZ3	TRP	A	141	−22.669	−2.858	−36.532	1.00	25.72
ATOM	1080	CH2	TRP	A	141	−23.891	−2.304	−36.940	1.00	24.95
ATOM	1081	CZ2	TRP	A	141	−24.721	−1.666	−36.051	1.00	25.14
ATOM	1082	C	TRP	A	141	−22.078	−4.666	−32.448	1.00	24.47
ATOM	1083	O	TRP	A	141	−23.155	−5.152	−32.831	1.00	24.52
ATOM	1084	N	LEU	A	142	−20.904	−4.991	−32.985	1.00	24.39
ATOM	1085	CA	LEU	A	142	−20.806	−6.024	−34.010	1.00	25.05
ATOM	1086	CB	LEU	A	142	−19.361	−6.199	−34.473	1.00	24.56
ATOM	1087	CG	LEU	A	142	−18.754	−5.023	−35.252	1.00	24.44
ATOM	1088	CD1	LEU	A	142	−17.274	−5.304	−35.441	1.00	23.72
ATOM	1089	CD2	LEU	A	142	−19.424	−4.793	−36.624	1.00	25.76
ATOM	1090	C	LEU	A	142	−21.406	−7.364	−33.556	1.00	25.97
ATOM	1091	O	LEU	A	142	−22.195	−7.966	−34.283	1.00	26.49
ATOM	1092	N	ILE	A	143	−21.045	−7.814	−32.359	1.00	27.04
ATOM	1093	CA	ILE	A	143	−21.596	−9.040	−31.792	1.00	28.46
ATOM	1094	CB	ILE	A	143	−20.959	−9.362	−30.425	1.00	28.30
ATOM	1095	CG1	ILE	A	143	−19.474	−9.722	−30.609	1.00	27.97
ATOM	1096	CD1	ILE	A	143	−18.707	−9.814	−29.301	1.00	29.85
ATOM	1097	CG2	ILE	A	143	−21.720	−10.494	−29.717	1.00	29.57
ATOM	1098	C	ILE	A	143	−23.124	−8.992	−31.682	1.00	29.52
ATOM	1099	O	ILE	A	143	−23.813	−9.928	−32.118	1.00	30.10
ATOM	1100	N	ASN	A	144	−23.655	−7.916	−31.111	1.00	30.37
ATOM	1101	CA	ASN	A	144	−25.109	−7.768	−30.988	1.00	32.18
ATOM	1102	CB	ASN	A	144	−25.479	−6.522	−30.186	1.00	32.73
ATOM	1103	CG	ASN	A	144	−26.960	−6.489	−29.792	1.00	36.88
ATOM	1104	OD1	ASN	A	144	−27.444	−7.350	−29.041	1.00	42.25
ATOM	1105	ND2	ASN	A	144	−27.685	−5.488	−30.291	1.00	40.10
ATOM	1106	C	ASN	A	144	−25.820	−7.760	−32.341	1.00	32.17
ATOM	1107	O	ASN	A	144	−27.012	−8.029	−32.411	1.00	32.73
ATOM	1108	N	ASN	A	145	−25.094	−7.460	−33.411	1.00	32.19
ATOM	1109	CA	ASN	A	145	−25.705	−7.403	−34.726	1.00	32.78
ATOM	1110	CB	ASN	A	145	−25.526	−6.014	−35.331	1.00	33.16
ATOM	1111	CG	ASN	A	145	−26.397	−4.986	−34.639	1.00	34.32
ATOM	1112	OD1	ASN	A	145	−27.576	−4.841	−34.969	1.00	37.42
ATOM	1113	ND2	ASN	A	145	−25.834	−4.289	−33.647	1.00	34.31
ATOM	1114	C	ASN	A	145	−25.285	−8.533	−35.671	1.00	33.13
ATOM	1115	O	ASN	A	145	−25.412	−8.415	−36.902	1.00	33.03
ATOM	1116	N	ASN	A	146	−24.789	−9.618	−35.065	1.00	33.43
ATOM	1117	CA	ASN	A	146	−24.475	−10.885	−35.736	1.00	34.14
ATOM	1118	CB	ASN	A	146	−25.710	−11.459	−36.461	1.00	34.85

TABLE 15-continued

ATOM	1119	CG	ASN	A	146	−26.994	−11.280	−35.657	1.00	37.41
ATOM	1120	OD1	ASN	A	146	−27.033	−11.543	−34.450	1.00	41.43
ATOM	1121	ND2	ASN	A	146	−28.047	−10.814	−36.321	1.00	41.54
ATOM	1122	C	ASN	A	146	−23.266	−10.795	−36.652	1.00	33.92
ATOM	1123	O	ASN	A	146	−23.216	−11.419	−37.724	1.00	33.76
ATOM	1124	N	TYR	A	147	−22.280	−10.013	−36.221	1.00	32.92
ATOM	1125	CA	TYR	A	147	−21.049	−9.870	−36.974	1.00	32.90
ATOM	1126	CB	TYR	A	147	−20.859	−8.423	−37.451	1.00	33.31
ATOM	1127	CG	TYR	A	147	−21.966	−7.893	−38.339	1.00	33.29
ATOM	1128	CD1	TYR	A	147	−22.168	−8.410	−39.621	1.00	34.11
ATOM	1129	CE1	TYR	A	147	−23.177	−7.924	−40.438	1.00	34.19
ATOM	1130	CZ	TYR	A	147	−23.986	−6.888	−39.983	1.00	34.10
ATOM	1131	OH	TYR	A	147	−24.987	−6.399	−40.794	1.00	35.08
ATOM	1132	CE2	TYR	A	147	−23.798	−6.345	−38.722	1.00	32.48
ATOM	1133	CD2	TYR	A	147	−22.792	−6.852	−37.906	1.00	32.03
ATOM	1134	C	TYR	A	147	−19.857	−10.297	−36.138	1.00	32.74
ATOM	1135	O	TYR	A	147	−18.795	−9.710	−36.242	1.00	32.03
ATOM	1136	N	GLN	A	148	−20.037	−11.325	−35.312	1.00	33.44
ATOM	1137	CA	GLN	A	148	−18.977	−11.807	−34.427	1.00	34.39
ATOM	1138	CB	GLN	A	148	−19.483	−12.971	−33.573	1.00	34.76
ATOM	1139	CG	GLN	A	148	−18.523	−13.445	−32.481	1.00	35.56
ATOM	1140	CD	GLN	A	148	−19.216	−14.273	−31.401	1.00	36.59
ATOM	1141	OE1	GLN	A	148	−20.296	−13.913	−30.916	1.00	41.20
ATOM	1142	NE2	GLN	A	148	−18.589	−15.380	−31.008	1.00	38.65
ATOM	1143	C	GLN	A	148	−17.690	−12.196	−35.176	1.00	34.46
ATOM	1144	O	GLN	A	148	−16.582	−12.002	−34.654	1.00	34.20
ATOM	1145	N	PHE	A	149	−17.841	−12.735	−36.391	1.00	34.19
ATOM	1146	CA	PHE	A	149	−16.696	−13.131	−37.217	1.00	34.10
ATOM	1147	CB	PHE	A	149	−17.140	−13.804	−38.534	1.00	35.60
ATOM	1148	CG	PHE	A	149	−18.346	−13.168	−39.193	1.00	38.70
ATOM	1149	CD1	PHE	A	149	−19.388	−13.976	−39.676	1.00	42.72
ATOM	1150	CE1	PHE	A	149	−20.518	−13.417	−40.295	1.00	43.69
ATOM	1151	CZ	PHE	A	149	−20.615	−12.019	−40.437	1.00	43.12
ATOM	1152	CE2	PHE	A	149	−19.567	−11.188	−39.953	1.00	43.20
ATOM	1153	CD2	PHE	A	149	−18.451	−11.772	−39.341	1.00	42.33
ATOM	1154	C	PHE	A	149	−15.746	−11.960	−37.517	1.00	32.49
ATOM	1155	O	PHE	A	149	−14.528	−12.132	−37.548	1.00	32.23
ATOM	1156	N	THR	A	150	−16.327	−10.789	−37.751	1.00	30.95
ATOM	1157	CA	THR	A	150	−15.570	−9.568	−38.040	1.00	29.68
ATOM	1158	CB	THR	A	150	−16.512	−8.424	−38.445	1.00	29.97
ATOM	1159	OG1	THR	A	150	−17.162	−8.768	−39.673	1.00	30.58
ATOM	1160	CG2	THR	A	150	−15.758	−7.096	−38.637	1.00	29.18
ATOM	1161	C	THR	A	150	−14.727	−9.203	−36.822	1.00	28.54
ATOM	1162	O	THR	A	150	−13.566	−8.827	−36.965	1.00	28.38
ATOM	1163	N	VAL	A	151	−15.310	−9.354	−35.636	1.00	27.23
ATOM	1164	CA	VAL	A	151	−14.597	−9.146	−34.374	1.00	26.78
ATOM	1165	CB	VAL	A	151	−15.529	−9.352	−33.148	1.00	26.25
ATOM	1166	CG1	VAL	A	151	−14.752	−9.213	−31.832	1.00	26.50
ATOM	1167	CG2	VAL	A	151	−16.690	−8.361	−33.178	1.00	24.41
ATOM	1168	C	VAL	A	151	−13.384	−10.080	−34.305	1.00	27.61
ATOM	1169	O	VAL	A	151	−12.246	−9.638	−34.106	1.00	26.67
ATOM	1170	N	SER	A	152	−13.625	−11.375	−34.505	1.00	28.53
ATOM	1171	CA	SER	A	152	−12.551	−12.369	−34.470	1.00	30.01
ATOM	1172	CB	SER	A	152	−13.102	−13.759	−34.773	1.00	30.18
ATOM	1173	OG	SER	A	152	−13.612	−14.300	−33.586	1.00	32.28
ATOM	1174	C	SER	A	152	−11.419	−12.091	−35.430	1.00	30.23
ATOM	1175	O	SER	A	152	−10.250	−12.250	−35.090	1.00	30.95
ATOM	1176	N	ASN	A	153	−11.762	−11.705	−36.641	1.00	31.46
ATOM	1177	CA	ASN	A	153	−10.753	−11.624	−37.674	1.00	32.41
ATOM	1178	CB	ASN	A	153	−11.333	−12.118	−38.997	1.00	33.62
ATOM	1179	CG	ASN	A	153	−11.791	−13.584	−38.902	1.00	36.13
ATOM	1180	OD1	ASN	A	153	−12.931	−13.918	−39.231	1.00	40.99
ATOM	1181	ND2	ASN	A	153	−10.917	−14.444	−38.383	1.00	37.61
ATOM	1182	C	ASN	A	153	−10.060	−10.272	−37.787	1.00	32.10
ATOM	1183	O	ASN	A	153	−8.850	−10.213	−38.020	1.00	32.79
ATOM	1184	N	VAL	A	154	−10.810	−9.193	−37.577	1.00	30.55
ATOM	1185	CA	VAL	A	154	−10.251	−7.854	−37.750	1.00	28.93
ATOM	1186	CB	VAL	A	154	−11.217	−6.925	−38.537	1.00	29.03
ATOM	1187	CG1	VAL	A	154	−10.565	−5.577	−38.827	1.00	29.23
ATOM	1188	CG2	VAL	A	154	−11.654	−7.585	−39.860	1.00	29.87
ATOM	1189	C	VAL	A	154	−9.824	−7.211	−36.414	1.00	27.28
ATOM	1190	O	VAL	A	154	−8.722	−6.678	−36.306	1.00	26.96
ATOM	1191	N	ILE	A	155	−10.685	−7.288	−35.403	1.00	25.13
ATOM	1192	CA	ILE	A	155	−10.525	−6.459	−34.197	1.00	23.05
ATOM	1193	CB	ILE	A	155	−11.900	−5.972	−33.670	1.00	23.10
ATOM	1194	CG1	ILE	A	155	−12.596	−5.128	−34.741	1.00	22.49
ATOM	1195	CD1	ILE	A	155	−14.006	−4.680	−34.375	1.00	22.72
ATOM	1196	CG2	ILE	A	155	−11.731	−5.144	−32.399	1.00	23.05
ATOM	1197	C	ILE	A	155	−9.710	−7.136	−33.092	1.00	22.44
ATOM	1198	O	ILE	A	155	−8.789	−6.537	−32.533	1.00	21.14

TABLE 15-continued

ATOM	1199	N	TRP	A	156	−10.006	−8.409	−32.822	1.00	21.48
ATOM	1200	CA	TRP	A	156	−9.392	−9.099	−31.696	1.00	21.75
ATOM	1201	CB	TRP	A	156	−9.958	−10.520	−31.511	1.00	22.50
ATOM	1202	CG	TRP	A	156	−9.298	−11.245	−30.371	1.00	23.43
ATOM	1203	CD1	TRP	A	156	−8.420	−12.298	−30.461	1.00	24.92
ATOM	1204	NE1	TRP	A	156	−8.011	−12.680	−29.198	1.00	24.85
ATOM	1205	CE2	TRP	A	156	−8.600	−11.863	−28.269	1.00	26.38
ATOM	1206	CD2	TRP	A	156	−9.416	−10.941	−28.970	1.00	25.03
ATOM	1207	CE3	TRP	A	156	−10.139	−9.983	−28.236	1.00	25.01
ATOM	1208	CZ3	TRP	A	156	−10.024	−9.982	−26.844	1.00	24.30
ATOM	1209	CH2	TRP	A	156	−9.206	−10.910	−26.185	1.00	23.97
ATOM	1210	CZ2	TRP	A	156	−8.495	−11.861	−26.875	1.00	24.60
ATOM	1211	C	TRP	A	156	−7.845	−9.109	−31.699	1.00	21.52
ATOM	1212	O	TRP	A	156	−7.235	−8.945	−30.648	1.00	21.78
ATOM	1213	N	PRO	A	157	−7.209	−9.303	−32.870	1.00	21.66
ATOM	1214	CA	PRO	A	157	−5.726	−9.258	−32.878	1.00	21.40
ATOM	1215	CB	PRO	A	157	−5.378	−9.459	−34.360	1.00	21.26
ATOM	1216	CG	PRO	A	157	−6.583	−10.172	−34.955	1.00	22.82
ATOM	1217	CD	PRO	A	157	−7.762	−9.596	−34.207	1.00	21.45
ATOM	1218	C	PRO	A	157	−5.162	−7.898	−32.410	1.00	21.30
ATOM	1219	O	PRO	A	157	−4.092	−7.837	−31.795	1.00	21.11
ATOM	1220	N	ILE	A	158	−5.881	−6.821	−32.724	1.00	20.52
ATOM	1221	CA	ILE	A	158	−5.457	−5.467	−32.318	1.00	19.93
ATOM	1222	CB	ILE	A	158	−6.273	−4.348	−33.034	1.00	19.73
ATOM	1223	CG1	ILE	A	158	−6.261	−4.527	−34.559	1.00	21.25
ATOM	1224	CD1	ILE	A	158	−7.229	−3.640	−35.351	1.00	20.03
ATOM	1225	CG2	ILE	A	158	−5.686	−2.971	−32.670	1.00	20.16
ATOM	1226	C	ILE	A	158	−5.632	−5.366	−30.816	1.00	19.58
ATOM	1227	O	ILE	A	158	−4.701	−5.023	−30.081	1.00	19.04
ATOM	1228	N	VAL	A	159	−6.840	−5.704	−30.359	1.00	19.39
ATOM	1229	CA	VAL	A	159	−7.201	−5.624	−28.953	1.00	19.15
ATOM	1230	CB	VAL	A	159	−8.687	−6.026	−28.744	1.00	19.06
ATOM	1231	CG1	VAL	A	159	−9.046	−6.028	−27.253	1.00	20.39
ATOM	1232	CG2	VAL	A	159	−9.604	−5.090	−29.511	1.00	20.08
ATOM	1233	C	VAL	A	159	−6.280	−6.501	−28.105	1.00	19.39
ATOM	1234	O	VAL	A	159	−5.794	−6.089	−27.036	1.00	18.63
ATOM	1235	N	ARG	A	160	−6.022	−7.721	−28.585	1.00	18.93
ATOM	1236	CA	ARG	A	160	−5.171	−8.633	−27.833	1.00	19.64
ATOM	1237	CB	ARG	A	160	−5.078	−10.005	−28.513	1.00	19.17
ATOM	1238	CG	ARG	A	160	−4.064	−10.942	−27.872	1.00	21.41
ATOM	1239	CD	ARG	A	160	−3.978	−12.278	−28.637	1.00	23.47
ATOM	1240	NE	ARG	A	160	−3.542	−12.066	−30.021	1.00	29.25
ATOM	1241	CZ	ARG	A	160	−3.963	−12.771	−31.074	1.00	33.46
ATOM	1242	NH1	ARG	A	160	−4.839	−13.764	−30.929	1.00	36.48
ATOM	1243	NH2	ARG	A	160	−3.501	−12.489	−32.289	1.00	34.33
ATOM	1244	C	ARG	A	160	−3.785	−8.058	−27.580	1.00	18.24
ATOM	1245	O	ARG	A	160	−3.262	−8.233	−26.517	1.00	18.13
ATOM	1246	N	ASN	A	161	−3.182	−7.371	−28.551	1.00	18.57
ATOM	1247	CA	ASN	A	161	−1.875	−6.717	−28.289	1.00	18.40
ATOM	1248	CB	ASN	A	161	−1.344	−6.052	−29.561	1.00	18.82
ATOM	1249	CG	ASN	A	161	−0.772	−7.055	−30.549	1.00	20.68
ATOM	1250	OD1	ASN	A	161	−0.240	−8.097	−30.149	1.00	22.60
ATOM	1251	ND2	ASN	A	161	−0.883	−6.751	−31.837	1.00	19.81
ATOM	1252	C	ASN	A	161	−1.946	−5.656	−27.182	1.00	18.36
ATOM	1253	O	ASN	A	161	−1.078	−5.581	−26.313	1.00	17.42
ATOM	1254	N	ASP	A	162	−2.982	−4.816	−27.233	1.00	17.86
ATOM	1255	CA	ASP	A	162	−3.163	−3.782	−26.194	1.00	16.85
ATOM	1256	CB	ASP	A	162	−4.293	−2.821	−26.586	1.00	16.71
ATOM	1257	CG	ASP	A	162	−3.851	−1.791	−27.623	1.00	17.46
ATOM	1258	OD1	ASP	A	162	−2.648	−1.440	−27.681	1.00	16.98
ATOM	1259	OD2	ASP	A	162	−4.719	−1.333	−28.388	1.00	18.89
ATOM	1260	C	ASP	A	162	−3.421	−4.354	−24.799	1.00	16.51
ATOM	1261	O	ASP	A	162	−2.846	−3.897	−23.822	1.00	15.71
ATOM	1262	N	LEU	A	163	−4.278	−5.371	−24.715	1.00	16.83
ATOM	1263	CA	LEU	A	163	−4.532	−6.071	−23.459	1.00	16.55
ATOM	1264	CB	LEU	A	163	−5.661	−7.088	−23.637	1.00	16.96
ATOM	1265	CG	LEU	A	163	−7.030	−6.506	−23.975	1.00	19.29
ATOM	1266	CD1	LEU	A	163	−8.007	−7.663	−24.227	1.00	19.71
ATOM	1267	CD2	LEU	A	163	−7.484	−5.631	−22.818	1.00	21.19
ATOM	1268	C	LEU	A	163	−3.279	−6.750	−22.883	1.00	16.19
ATOM	1269	O	LEU	A	163	−3.035	−6.690	−21.688	1.00	15.47
ATOM	1270	N	ASN	A	164	−2.495	−7.401	−23.748	1.00	16.85
ATOM	1271	CA	ASN	A	164	−1.251	−8.040	−23.305	1.00	16.44
ATOM	1272	CB	ASN	A	164	−0.602	−8.836	−24.450	1.00	17.06
ATOM	1273	CG	ASN	A	164	−1.333	−10.153	−24.718	1.00	19.63
ATOM	1274	OD1	ASN	A	164	−2.274	−10.513	−23.982	1.00	20.97
ATOM	1275	ND2	ASN	A	164	−0.903	−10.881	−25.756	1.00	19.79
ATOM	1276	C	ASN	A	164	−0.301	−7.022	−22.761	1.00	16.80
ATOM	1277	O	ASN	A	164	0.349	−7.261	−21.751	1.00	15.97
ATOM	1278	N	TYR	A	165	−0.250	−5.860	−23.415	1.00	16.45

TABLE 15-continued

ATOM	1279	CA	TYR	A	165	0.573	−4.744	−22.930	1.00	16.15
ATOM	1280	CB	TYR	A	165	0.420	−3.508	−23.844	1.00	16.63
ATOM	1281	CG	TYR	A	165	1.286	−2.356	−23.391	1.00	16.41
ATOM	1282	CD1	TYR	A	165	0.838	−1.459	−22.404	1.00	17.94
ATOM	1283	CE1	TYR	A	165	1.651	−0.402	−21.958	1.00	17.84
ATOM	1284	CZ	TYR	A	165	2.916	−0.223	−22.517	1.00	18.36
ATOM	1285	OH	TYR	A	165	3.699	0.841	−22.091	1.00	16.54
ATOM	1286	CE2	TYR	A	165	3.383	−1.105	−23.502	1.00	16.73
ATOM	1287	CD2	TYR	A	165	2.552	−2.157	−23.942	1.00	16.01
ATOM	1288	C	TYR	A	165	0.198	−4.366	−21.503	1.00	16.26
ATOM	1289	O	TYR	A	165	1.073	−4.218	−20.650	1.00	15.43
ATOM	1290	N	VAL	A	166	−1.104	−4.177	−21.258	1.00	16.75
ATOM	1291	CA	VAL	A	166	−1.600	−3.786	−19.933	1.00	17.39
ATOM	1292	CB	VAL	A	166	−3.124	−3.479	−19.986	1.00	17.57
ATOM	1293	CG1	VAL	A	166	−3.712	−3.197	−18.582	1.00	19.25
ATOM	1294	CG2	VAL	A	166	−3.363	−2.272	−20.909	1.00	16.49
ATOM	1295	C	VAL	A	166	−1.258	−4.829	−18.865	1.00	17.83
ATOM	1296	O	VAL	A	166	−0.741	−4.483	−17.792	1.00	18.00
ATOM	1297	N	ALA	A	167	−1.520	−6.099	−19.188	1.00	18.26
ATOM	1298	CA	ALA	A	167	−1.233	−7.218	−18.285	1.00	18.92
ATOM	1299	CB	ALA	A	167	−1.716	−8.532	−18.899	1.00	18.25
ATOM	1300	C	ALA	A	167	0.251	−7.325	−17.956	1.00	19.08
ATOM	1301	O	ALA	A	167	0.611	−7.757	−16.854	1.00	20.02
ATOM	1302	N	GLN	A	168	1.097	−6.955	−18.920	1.00	19.13
ATOM	1303	CA	GLN	A	168	2.558	−7.022	−18.749	1.00	19.21
ATOM	1304	CB	GLN	A	168	3.218	−7.201	−20.115	1.00	19.08
ATOM	1305	CG	GLN	A	168	4.739	−7.373	−20.053	1.00	20.55
ATOM	1306	CD	GLN	A	168	5.337	−7.891	−21.355	1.00	20.26
ATOM	1307	OE1	GLN	A	168	4.634	−8.378	−22.238	1.00	22.69
ATOM	1308	NE2	GLN	A	168	6.643	−7.772	−21.476	1.00	23.10
ATOM	1309	C	GLN	A	168	3.182	−5.807	−18.048	1.00	19.60
ATOM	1310	O	GLN	A	168	4.104	−5.942	−17.205	1.00	18.87
ATOM	1311	N	TYR	A	169	2.709	−4.609	−18.404	1.00	19.23
ATOM	1312	CA	TYR	A	169	3.399	−3.377	−18.011	1.00	19.45
ATOM	1313	CB	TYR	A	169	3.760	−2.560	−19.266	1.00	20.43
ATOM	1314	CG	TYR	A	169	4.773	−3.203	−20.203	1.00	21.30
ATOM	1315	CD1	TYR	A	169	6.125	−3.243	−19.872	1.00	23.63
ATOM	1316	CE1	TYR	A	169	7.065	−3.822	−20.723	1.00	24.59
ATOM	1317	CZ	TYR	A	169	6.651	−4.359	−21.926	1.00	23.11
ATOM	1318	OH	TYR	A	169	7.580	−4.924	−22.779	1.00	25.26
ATOM	1319	CE2	TYR	A	169	5.309	−4.330	−22.288	1.00	22.49
ATOM	1320	CD2	TYR	A	169	4.375	−3.754	−21.422	1.00	20.87
ATOM	1321	C	TYR	A	169	2.675	−2.449	−17.015	1.00	19.49
ATOM	1322	O	TYR	A	169	3.205	−1.386	−16.691	1.00	19.69
ATOM	1323	N	TRP	A	170	1.508	−2.850	−16.498	1.00	18.91
ATOM	1324	CA	TRP	A	170	0.735	−1.981	−15.588	1.00	19.29
ATOM	1325	CB	TRP	A	170	−0.610	−2.626	−15.208	1.00	18.85
ATOM	1326	CG	TRP	A	170	−0.489	−3.743	−14.215	1.00	21.04
ATOM	1327	CD1	TRP	A	170	−0.342	−5.083	−14.489	1.00	20.67
ATOM	1328	NE1	TRP	A	170	−0.259	−5.793	−13.317	1.00	22.09
ATOM	1329	CE2	TRP	A	170	−0.336	−4.928	−12.258	1.00	19.19
ATOM	1330	CD2	TRP	A	170	−0.481	−3.621	−12.789	1.00	20.35
ATOM	1331	CE3	TRP	A	170	−0.582	−2.530	−11.905	1.00	19.61
ATOM	1332	CZ3	TRP	A	170	−0.546	−2.769	−10.542	1.00	22.33
ATOM	1333	CH2	TRP	A	170	−0.404	−4.090	−10.038	1.00	21.08
ATOM	1334	CZ2	TRP	A	170	−0.297	−5.179	−10.884	1.00	20.76
ATOM	1335	C	TRP	A	170	1.526	−1.592	−14.336	1.00	19.20
ATOM	1336	O	TRP	A	170	1.395	−0.475	−13.808	1.00	19.24
ATOM	1337	N	ASN	A	171	2.371	−2.504	−13.858	1.00	19.13
ATOM	1338	CA	ASN	A	171	3.054	−2.280	−12.596	1.00	20.12
ATOM	1339	CB	ASN	A	171	3.178	−3.603	−11.820	1.00	20.59
ATOM	1340	CG	ASN	A	171	3.646	−3.419	−10.392	1.00	22.31
ATOM	1341	OD1	ASN	A	171	4.531	−4.155	−9.938	1.00	23.68
ATOM	1342	ND2	ASN	A	171	3.081	−2.435	−9.684	1.00	18.77
ATOM	1343	C	ASN	A	171	4.392	−1.557	−12.797	1.00	20.93
ATOM	1344	O	ASN	A	171	5.333	−1.724	−12.022	1.00	20.35
ATOM	1345	N	GLN	A	172	4.449	−0.712	−13.826	1.00	20.64
ATOM	1346	CA	GLN	A	172	5.644	0.061	−14.156	1.00	22.31
ATOM	1347	CB	GLN	A	172	6.262	−0.452	−15.469	1.00	22.04
ATOM	1348	CG	GLN	A	172	6.784	−1.895	−15.312	1.00	25.79
ATOM	1349	CD	GLN	A	172	7.536	−2.450	−16.515	1.00	27.61
ATOM	1350	OE1	GLN	A	172	8.276	−1.735	−17.214	1.00	35.65
ATOM	1351	NE2	GLN	A	172	7.367	−3.755	−16.752	1.00	33.80
ATOM	1352	C	GLN	A	172	5.287	1.539	−14.268	1.00	21.36
ATOM	1353	O	GLN	A	172	4.175	1.867	−14.704	1.00	21.04
ATOM	1354	N	THR	A	173	6.209	2.417	−13.871	1.00	19.73
ATOM	1355	CA	THR	A	173	5.948	3.871	−13.928	1.00	20.07
ATOM	1356	CB	THR	A	173	7.001	4.703	−13.168	1.00	19.48
ATOM	1357	OG1	THR	A	173	8.300	4.427	−13.707	1.00	21.56
ATOM	1358	CG2	THR	A	173	6.988	4.375	−11.690	1.00	20.86

TABLE 15-continued

ATOM	1359	C	THR	A	173	5.913	4.347	−15.375	1.00	18.53
ATOM	1360	O	THR	A	173	6.395	3.665	−16.292	1.00	18.48
ATOM	1361	N	GLY	A	174	5.345	5.528	−15.582	1.00	18.38
ATOM	1362	CA	GLY	A	174	5.363	6.149	−16.903	1.00	17.13
ATOM	1363	C	GLY	A	174	4.760	7.522	−16.736	1.00	16.77
ATOM	1364	O	GLY	A	174	4.462	7.939	−15.605	1.00	16.87
ATOM	1365	N	PHE	A	175	4.571	8.223	−17.849	1.00	14.68
ATOM	1366	CA	PHE	A	175	4.004	9.577	−17.776	1.00	14.68
ATOM	1367	CB	PHE	A	175	4.522	10.432	−18.948	1.00	15.16
ATOM	1368	CG	PHE	A	175	5.943	10.847	−18.756	1.00	15.28
ATOM	1369	CD1	PHE	A	175	6.981	10.000	−19.144	1.00	18.04
ATOM	1370	CE1	PHE	A	175	8.313	10.359	−18.915	1.00	19.53
ATOM	1371	CZ	PHE	A	175	8.609	11.582	−18.278	1.00	19.12
ATOM	1372	CE2	PHE	A	175	7.571	12.429	−17.876	1.00	18.63
ATOM	1373	CD2	PHE	A	175	6.247	12.054	−18.113	1.00	17.67
ATOM	1374	C	PHE	A	175	2.483	9.584	−17.655	1.00	14.11
ATOM	1375	O	PHE	A	175	1.799	8.683	−18.175	1.00	14.32
ATOM	1376	N	ASP	A	176	1.972	10.591	−16.938	1.00	14.79
ATOM	1377	CA	ASP	A	176	0.541	10.764	−16.713	1.00	14.45
ATOM	1378	CB	ASP	A	176	0.297	11.661	−15.506	1.00	13.51
ATOM	1379	CG	ASP	A	176	0.685	13.126	−15.760	1.00	14.99
ATOM	1380	OD1	ASP	A	176	1.774	13.399	−16.329	1.00	14.32
ATOM	1381	OD2	ASP	A	176	−0.112	14.012	−15.376	1.00	15.08
ATOM	1382	C	ASP	A	176	−0.143	11.343	−17.962	1.00	14.21
ATOM	1383	O	ASP	A	176	0.525	11.641	−18.963	1.00	14.31
ATOM	1384	N	LEU	A	177	−1.467	11.511	−17.891	1.00	13.30
ATOM	1385	CA	LEU	A	177	−2.235	11.981	−19.048	1.00	13.44
ATOM	1386	CB	LEU	A	177	−3.752	11.839	−18.832	1.00	13.71
ATOM	1387	CG	LEU	A	177	−4.483	12.896	−18.012	1.00	14.11
ATOM	1388	CD1	LEU	A	177	−5.996	12.647	−18.061	1.00	13.65
ATOM	1389	CD2	LEU	A	177	−4.007	12.922	−16.553	1.00	14.74
ATOM	1390	C	LEU	A	177	−1.884	13.424	−19.452	1.00	13.51
ATOM	1391	O	LEU	A	177	−2.131	13.813	−20.600	1.00	13.74
ATOM	1392	N	TRP	A	178	−1.319	14.206	−18.521	1.00	12.53
ATOM	1393	CA	TRP	A	178	−0.804	15.553	−18.855	1.00	12.95
ATOM	1394	CB	TRP	A	178	−0.890	16.507	−17.660	1.00	12.67
ATOM	1395	CG	TRP	A	178	−2.247	16.549	−17.005	1.00	13.10
ATOM	1396	CD1	TRP	A	178	−2.504	16.508	−15.662	1.00	13.10
ATOM	1397	NE1	TRP	A	178	−3.856	16.568	−15.440	1.00	12.14
ATOM	1398	CE2	TRP	A	178	−4.501	16.646	−16.646	1.00	13.00
ATOM	1399	CD2	TRP	A	178	−3.516	16.641	−17.657	1.00	12.53
ATOM	1400	CE3	TRP	A	178	−3.919	16.715	−19.002	1.00	12.38
ATOM	1401	CZ3	TRP	A	178	−5.309	16.813	−19.290	1.00	13.91
ATOM	1402	CH2	TRP	A	178	−6.262	16.804	−18.257	1.00	13.52
ATOM	1403	CZ2	TRP	A	178	−5.883	16.718	−16.930	1.00	13.97
ATOM	1404	C	TRP	A	178	0.632	15.565	−19.400	1.00	13.35
ATOM	1405	O	TRP	A	178	1.147	16.641	−19.756	1.00	13.76
ATOM	1406	N	GLU	A	179	1.255	14.387	−19.447	1.00	13.33
ATOM	1407	CA	GLU	A	179	2.532	14.151	−20.117	1.00	13.32
ATOM	1408	CB	GLU	A	179	2.503	14.632	−21.582	1.00	12.64
ATOM	1409	CG	GLU	A	179	1.165	14.344	−22.280	1.00	13.03
ATOM	1410	CD	GLU	A	179	1.274	14.434	−23.785	1.00	14.68
ATOM	1411	OE1	GLU	A	179	0.895	15.478	−24.340	1.00	15.98
ATOM	1412	OE2	GLU	A	179	1.730	13.457	−24.405	1.00	15.44
ATOM	1413	C	GLU	A	179	3.667	14.853	−19.374	1.00	15.00
ATOM	1414	O	GLU	A	179	4.626	15.292	−20.004	1.00	14.90
ATOM	1415	N	GLU	A	180	3.561	14.932	−18.048	1.00	14.78
ATOM	1416	CA	GLU	A	180	4.476	15.745	−17.246	1.00	16.76
ATOM	1417	CB	GLU	A	180	3.719	16.928	−16.630	1.00	16.95
ATOM	1418	CG	GLU	A	180	3.282	17.972	−17.654	1.00	18.69
ATOM	1419	CD	GLU	A	180	2.240	18.969	−17.122	1.00	19.72
ATOM	1420	OE1	GLU	A	180	1.587	18.715	−16.077	1.00	19.00
ATOM	1421	OE2	GLU	A	180	2.076	20.020	−17.793	1.00	24.62
ATOM	1422	C	GLU	A	180	5.124	14.954	−16.104	1.00	16.50
ATOM	1423	O	GLU	A	180	6.265	15.202	−15.750	1.00	17.36
ATOM	1424	N	VAL	A	181	4.364	14.056	−15.488	1.00	16.77
ATOM	1425	CA	VAL	A	181	4.775	13.426	−14.218	1.00	16.87
ATOM	1426	CB	VAL	A	181	3.672	13.555	−13.130	1.00	16.78
ATOM	1427	CG1	VAL	A	181	4.030	12.732	−11.893	1.00	18.56
ATOM	1428	CG2	VAL	A	181	3.490	15.008	−12.726	1.00	17.21
ATOM	1429	C	VAL	A	181	5.057	11.953	−14.451	1.00	17.22
ATOM	1430	O	VAL	A	181	4.177	11.205	−14.825	1.00	16.93
ATOM	1431	N	ASN	A	182	6.290	11.532	−14.201	1.00	18.39
ATOM	1432	CA	ASN	A	182	6.674	10.123	−14.394	1.00	18.57
ATOM	1433	CB	ASN	A	182	8.136	10.079	−14.845	1.00	19.77
ATOM	1434	CG	ASN	A	182	8.665	8.669	−15.056	1.00	23.96
ATOM	1435	OD1	ASN	A	182	9.881	8.470	−15.058	1.00	33.20
ATOM	1436	ND2	ASN	A	182	7.794	7.706	−15.258	1.00	23.63
ATOM	1437	C	ASN	A	182	6.440	9.375	−13.073	1.00	18.31
ATOM	1438	O	ASN	A	182	7.132	9.621	−12.087	1.00	18.80

TABLE 15-continued

ATOM	1439	N	GLY	A	183	5.436	8.508	−13.034	1.00	16.83
ATOM	1440	CA	GLY	A	183	5.091	7.828	−11.790	1.00	15.98
ATOM	1441	C	GLY	A	183	3.989	6.837	−12.033	1.00	15.59
ATOM	1442	O	GLY	A	183	3.937	6.228	−13.117	1.00	15.30
ATOM	1443	N	SER	A	184	3.119	6.670	−11.035	1.00	14.95
ATOM	1444	CA	SER	A	184	1.927	5.823	−11.151	1.00	15.45
ATOM	1445	CB	SER	A	184	1.844	4.792	−10.017	1.00	15.76
ATOM	1446	OG	SER	A	184	2.998	3.935	−10.027	1.00	17.33
ATOM	1447	C	SER	A	184	0.731	6.758	−11.073	1.00	15.14
ATOM	1448	O	SER	A	184	0.646	7.546	−10.148	1.00	15.83
ATOM	1449	N	SER	A	185	−0.151	6.706	−12.066	1.00	14.73
ATOM	1450	CA	SER	A	185	−1.169	7.755	−12.190	1.00	13.87
ATOM	1451	CB	SER	A	185	−0.991	8.535	−13.515	1.00	14.73
ATOM	1452	OG	SER	A	185	−1.793	9.721	−13.544	1.00	14.93
ATOM	1453	C	SER	A	185	−2.551	7.140	−12.127	1.00	13.49
ATOM	1454	O	SER	A	185	−2.834	6.134	−12.792	1.00	13.35
ATOM	1455	N	PHE	A	186	−3.427	7.782	−11.354	1.00	13.72
ATOM	1456	CA	PHE	A	186	−4.764	7.275	−11.092	1.00	13.43
ATOM	1457	CB	PHE	A	186	−5.511	8.319	−10.260	1.00	13.58
ATOM	1458	CG	PHE	A	186	−6.807	7.839	−9.662	1.00	13.52
ATOM	1459	CD1	PHE	A	186	−6.819	6.873	−8.655	1.00	16.11
ATOM	1460	CE1	PHE	A	186	−8.004	6.489	−8.036	1.00	17.80
ATOM	1461	CZ	PHE	A	186	−9.214	7.062	−8.442	1.00	16.18
ATOM	1462	CE2	PHE	A	186	−9.211	8.051	−9.432	1.00	15.77
ATOM	1463	CD2	PHE	A	186	−8.003	8.435	−10.030	1.00	14.62
ATOM	1464	C	PHE	A	186	−5.552	6.946	−12.372	1.00	13.57
ATOM	1465	O	PHE	A	186	−6.053	5.839	−12.524	1.00	13.36
ATOM	1466	N	PHE	A	187	−5.693	7.927	−13.267	1.00	12.53
ATOM	1467	CA	PHE	A	187	−6.416	7.762	−14.527	1.00	12.84
ATOM	1468	CB	PHE	A	187	−6.284	9.056	−15.356	1.00	11.69
ATOM	1469	CG	PHE	A	187	−6.949	9.016	−16.711	1.00	13.25
ATOM	1470	CD1	PHE	A	187	−8.284	9.338	−16.855	1.00	12.86
ATOM	1471	CE1	PHE	A	187	−8.893	9.342	−18.102	1.00	14.12
ATOM	1472	CZ	PHE	A	187	−8.139	9.041	−19.236	1.00	14.05
ATOM	1473	CE2	PHE	A	187	−6.806	8.721	−19.111	1.00	14.30
ATOM	1474	CD2	PHE	A	187	−6.206	8.711	−17.857	1.00	15.10
ATOM	1475	C	PHE	A	187	−5.887	6.563	−15.318	1.00	12.69
ATOM	1476	O	PHE	A	187	−6.666	5.837	−15.932	1.00	14.00
ATOM	1477	N	THR	A	188	−4.571	6.357	−15.294	1.00	12.97
ATOM	1478	CA	THR	A	188	−3.938	5.302	−16.084	1.00	13.65
ATOM	1479	CB	THR	A	188	−2.411	5.541	−16.104	1.00	13.69
ATOM	1480	OG1	THR	A	188	−2.158	6.789	−16.753	1.00	15.37
ATOM	1481	CG2	THR	A	188	−1.648	4.432	−16.833	1.00	13.24
ATOM	1482	C	THR	A	188	−4.284	3.929	−15.478	1.00	14.12
ATOM	1483	O	THR	A	188	−4.766	3.039	−16.173	1.00	14.40
ATOM	1484	N	VAL	A	189	−4.066	3.798	−14.173	1.00	13.34
ATOM	1485	CA	VAL	A	189	−4.348	2.543	−13.446	1.00	14.76
ATOM	1486	CB	VAL	A	189	−3.893	2.612	−11.958	1.00	14.90
ATOM	1487	CG1	VAL	A	189	−4.331	1.334	−11.186	1.00	16.95
ATOM	1488	CG2	VAL	A	189	−2.374	2.799	−11.865	1.00	15.31
ATOM	1489	C	VAL	A	189	−5.836	2.167	−13.560	1.00	14.48
ATOM	1490	O	VAL	A	189	−6.159	1.024	−13.853	1.00	14.65
ATOM	1491	N	ALA	A	190	−6.732	3.146	−13.372	1.00	13.77
ATOM	1492	CA	ALA	A	190	−8.171	2.858	−13.351	1.00	13.46
ATOM	1493	CB	ALA	A	190	−8.996	4.128	−12.922	1.00	12.74
ATOM	1494	C	ALA	A	190	−8.614	2.388	−14.706	1.00	13.27
ATOM	1495	O	ALA	A	190	−9.432	1.479	−14.815	1.00	13.24
ATOM	1496	N	ASN	A	191	−8.093	3.017	−15.760	1.00	12.50
ATOM	1497	CA	ASN	A	191	−8.438	2.598	−17.127	1.00	13.01
ATOM	1498	CB	ASN	A	191	−8.122	3.707	−18.137	1.00	12.65
ATOM	1499	CG	ASN	A	191	−9.191	4.781	−18.118	1.00	14.08
ATOM	1500	OD1	ASN	A	191	−10.319	4.541	−18.554	1.00	16.39
ATOM	1501	ND2	ASN	A	191	−8.857	5.955	−17.583	1.00	17.21
ATOM	1502	C	ASN	A	191	−7.815	1.259	−17.521	1.00	13.93
ATOM	1503	O	ASN	A	191	−8.412	0.490	−18.270	1.00	13.87
ATOM	1504	N	GLN	A	192	−6.636	0.995	−16.980	1.00	14.06
ATOM	1505	CA	GLN	A	192	−5.988	−0.311	−17.139	1.00	14.96
ATOM	1506	CB	GLN	A	192	−4.575	−0.274	−16.552	1.00	14.33
ATOM	1507	CG	GLN	A	192	−3.555	0.435	−17.500	1.00	13.64
ATOM	1508	CD	GLN	A	192	−2.206	0.635	−16.857	1.00	15.33
ATOM	1509	OE1	GLN	A	192	−2.074	0.568	−15.646	1.00	15.48
ATOM	1510	NE2	GLN	A	192	−1.182	0.925	−17.682	1.00	16.10
ATOM	1511	C	GLN	A	192	−6.855	−1.411	−16.519	1.00	15.11
ATOM	1512	O	GLN	A	192	−7.076	−2.457	−17.141	1.00	16.04
ATOM	1513	N	HIS	A	193	−7.398	−1.140	−15.329	1.00	15.81
ATOM	1514	CA	HIS	A	193	−8.314	−2.069	−14.668	1.00	16.01
ATOM	1515	CB	HIS	A	193	−8.746	−1.586	−13.281	1.00	16.72
ATOM	1516	CG	HIS	A	193	−9.806	−2.454	−12.669	1.00	17.39
ATOM	1517	ND1	HIS	A	193	−11.113	−2.039	−12.505	1.00	18.05
ATOM	1518	CE1	HIS	A	193	−11.821	−3.028	−11.983	1.00	18.70

TABLE 15-continued

ATOM	1519	NE2	HIS	A	193	−11.023	−4.071	−11.814	1.00	17.20
ATOM	1520	CD2	HIS	A	193	−9.758	−3.739	−12.242	1.00	18.04
ATOM	1521	C	HIS	A	193	−9.536	−2.343	−15.521	1.00	15.85
ATOM	1522	O	HIS	A	193	−9.898	−3.501	−15.732	1.00	15.70
ATOM	1523	N	ARG	A	194	−10.185	−1.285	−15.995	1.00	15.27
ATOM	1524	CA	ARG	A	194	−11.349	−1.437	−16.852	1.00	15.29
ATOM	1525	CB	ARG	A	194	−11.922	−0.073	−17.234	1.00	14.30
ATOM	1526	CG	ARG	A	194	−13.029	−0.212	−18.239	1.00	14.46
ATOM	1527	CD	ARG	A	194	−13.614	1.102	−18.723	1.00	15.43
ATOM	1528	NE	ARG	A	194	−14.589	0.780	−19.767	1.00	15.58
ATOM	1529	CZ	ARG	A	194	−15.624	1.539	−20.125	1.00	17.92
ATOM	1530	NH1	ARG	A	194	−15.815	2.744	−19.576	1.00	14.60
ATOM	1531	NH2	ARG	A	194	−16.451	1.095	−21.060	1.00	16.15
ATOM	1532	C	ARG	A	194	−11.047	−2.258	−18.111	1.00	15.74
ATOM	1533	O	ARG	A	194	−11.842	−3.120	−18.504	1.00	15.56
ATOM	1534	N	ALA	A	195	−9.918	−1.967	−18.758	1.00	15.60
ATOM	1535	CA	ALA	A	195	−9.562	−2.638	−20.004	1.00	15.90
ATOM	1536	CB	ALA	A	195	−8.254	−2.042	−20.591	1.00	15.40
ATOM	1537	C	ALA	A	195	−9.436	−4.150	−19.798	1.00	15.65
ATOM	1538	O	ALA	A	195	−9.959	−4.929	−20.610	1.00	16.79
ATOM	1539	N	LEU	A	196	−8.763	−4.550	−18.721	1.00	16.36
ATOM	1540	CA	LEU	A	196	−8.552	−5.976	−18.423	1.00	17.02
ATOM	1541	CB	LEU	A	196	−7.625	−6.126	−17.235	1.00	16.96
ATOM	1542	CG	LEU	A	196	−6.167	−5.744	−17.532	1.00	16.96
ATOM	1543	CD1	LEU	A	196	−5.375	−5.857	−16.252	1.00	18.93
ATOM	1544	CD2	LEU	A	196	−5.590	−6.636	−18.630	1.00	20.38
ATOM	1545	C	LEU	A	196	−9.877	−6.685	−18.167	1.00	17.92
ATOM	1546	O	LEU	A	196	−10.102	−7.795	−18.643	1.00	18.98
ATOM	1547	N	VAL	A	197	−10.779	−6.014	−17.454	1.00	18.51
ATOM	1548	CA	VAL	A	197	−12.112	−6.560	−17.181	1.00	18.81
ATOM	1549	CB	VAL	A	197	−12.875	−5.702	−16.130	1.00	18.26
ATOM	1550	CG1	VAL	A	197	−14.340	−6.173	−15.994	1.00	21.18
ATOM	1551	CG2	VAL	A	197	−12.149	−5.784	−14.778	1.00	19.79
ATOM	1552	C	VAL	A	197	−12.924	−6.779	−18.462	1.00	19.05
ATOM	1553	O	VAL	A	197	−13.456	−7.884	−18.693	1.00	18.62
ATOM	1554	N	GLU	A	198	−13.010	−5.752	−19.308	1.00	18.43
ATOM	1555	CA	GLU	A	198	−13.747	−5.873	−20.556	1.00	19.38
ATOM	1556	CB	GLU	A	198	−13.849	−4.517	−21.241	1.00	19.38
ATOM	1557	CG	GLU	A	198	−14.609	−3.530	−20.417	1.00	20.22
ATOM	1558	CD	GLU	A	198	−15.334	−2.537	−21.298	1.00	22.66
ATOM	1559	OE1	GLU	A	198	−16.313	−2.940	−21.940	1.00	22.16
ATOM	1560	OE2	GLU	A	198	−14.924	−1.369	−21.342	1.00	22.92
ATOM	1561	C	GLU	A	198	−13.094	−6.861	−21.509	1.00	19.78
ATOM	1562	O	GLU	A	198	−13.780	−7.506	−22.303	1.00	20.29
ATOM	1563	N	GLY	A	199	−11.770	−6.944	−21.435	1.00	19.78
ATOM	1564	CA	GLY	A	199	−10.998	−7.823	−22.314	1.00	20.88
ATOM	1565	C	GLY	A	199	−11.288	−9.285	−21.986	1.00	21.53
ATOM	1566	O	GLY	A	199	−11.546	−10.083	−22.879	1.00	22.36
ATOM	1567	N	ALA	A	200	−11.256	−9.615	−20.702	1.00	21.79
ATOM	1568	CA	ALA	A	200	−11.605	−10.956	−20.234	1.00	22.44
ATOM	1569	CB	ALA	A	200	−11.463	−11.038	−18.728	1.00	22.21
ATOM	1570	C	ALA	A	200	−13.016	−11.329	−20.696	1.00	22.54
ATOM	1571	O	ALA	A	200	−13.237	−12.419	−21.214	1.00	22.25
ATOM	1572	N	THR	A	201	−13.965	−10.403	−20.573	1.00	22.56
ATOM	1573	CA	THR	A	201	−15.345	−10.671	−20.989	1.00	22.77
ATOM	1574	CB	THR	A	201	−16.302	−9.527	−20.551	1.00	22.83
ATOM	1575	OG1	THR	A	201	−16.219	−9.387	−19.134	1.00	24.92
ATOM	1576	CG2	THR	A	201	−17.756	−9.819	−20.929	1.00	23.76
ATOM	1577	C	THR	A	201	−15.435	−10.905	−22.485	1.00	22.78
ATOM	1578	O	THR	A	201	−16.099	−11.851	−22.925	1.00	22.95
ATOM	1579	N	LEU	A	202	−14.760	−10.069	−23.275	1.00	21.78
ATOM	1580	CA	LEU	A	202	−14.805	−10.236	−24.717	1.00	22.62
ATOM	1581	CB	LEU	A	202	−14.149	−9.055	−25.434	1.00	22.14
ATOM	1582	CG	LEU	A	202	−14.142	−9.107	−26.964	1.00	23.10
ATOM	1583	CD1	LEU	A	202	−15.544	−9.198	−27.564	1.00	24.20
ATOM	1584	CD2	LEU	A	202	−13.346	−7.938	−27.570	1.00	22.53
ATOM	1585	C	LEU	A	202	−14.139	−11.552	−25.151	1.00	23.15
ATOM	1586	O	LEU	A	202	−14.649	−12.245	−26.036	1.00	22.90
ATOM	1587	N	ALA	A	203	−13.019	−11.883	−24.510	1.00	23.38
ATOM	1588	CA	ALA	A	203	−12.300	−13.129	−24.787	1.00	24.07
ATOM	1589	CB	ALA	A	203	−11.076	−13.229	−23.913	1.00	23.57
ATOM	1590	C	ALA	A	203	−13.211	−14.354	−24.569	1.00	24.38
ATOM	1591	O	ALA	A	203	−13.264	−15.244	−25.411	1.00	25.21
ATOM	1592	N	ALA	A	204	−13.920	−14.363	−23.447	1.00	25.20
ATOM	1593	CA	ALA	A	204	−14.849	−15.442	−23.093	1.00	26.63
ATOM	1594	CB	ALA	A	204	−15.450	−15.186	−21.727	1.00	26.12
ATOM	1595	C	ALA	A	204	−15.939	−15.583	−24.150	1.00	27.48
ATOM	1596	O	ALA	A	204	−16.267	−16.687	−24.564	1.00	28.39
ATOM	1597	N	THR	A	205	−16.494	−14.461	−24.593	1.00	27.71
ATOM	1598	CA	THR	A	205	−17.497	−14.470	−25.652	1.00	28.39

TABLE 15-continued

ATOM	1599	CB	THR	A	205	−18.088	−13.051	−25.855	1.00	28.42
ATOM	1600	OG1	THR	A	205	−18.669	−12.631	−24.622	1.00	29.32
ATOM	1601	CG2	THR	A	205	−19.150	−13.051	−26.932	1.00	27.32
ATOM	1602	C	THR	A	205	−16.968	−15.004	−26.981	1.00	28.72
ATOM	1603	O	THR	A	205	−17.697	−15.690	−27.719	1.00	29.06
ATOM	1604	N	LEU	A	206	−15.712	−14.698	−27.288	1.00	28.58
ATOM	1605	CA	LEU	A	206	−15.122	−15.122	−28.539	1.00	29.40
ATOM	1606	CB	LEU	A	206	−14.034	−14.144	−29.001	1.00	29.40
ATOM	1607	CG	LEU	A	206	−14.438	−12.694	−29.322	1.00	29.97
ATOM	1608	CD1	LEU	A	206	−13.212	−11.899	−29.755	1.00	30.30
ATOM	1609	CD2	LEU	A	206	−15.561	−12.629	−30.375	1.00	29.58
ATOM	1610	C	LEU	A	206	−14.540	−16.538	−28.489	1.00	29.55
ATOM	1611	O	LEU	A	206	−14.118	−17.054	−29.521	1.00	30.16
ATOM	1612	N	GLY	A	207	−14.500	−17.145	−27.307	1.00	30.30
ATOM	1613	CA	GLY	A	207	−13.786	−18.419	−27.122	1.00	30.91
ATOM	1614	C	GLY	A	207	−12.294	−18.274	−27.375	1.00	31.55
ATOM	1615	O	GLY	A	207	−11.654	−19.173	−27.935	1.00	31.31
ATOM	1616	N	GLN	A	208	−11.746	−17.115	−26.989	1.00	31.08
ATOM	1617	CA	GLN	A	208	−10.311	−16.877	−27.031	1.00	31.10
ATOM	1618	CB	GLN	A	208	−9.999	−15.540	−27.703	1.00	31.08
ATOM	1619	CG	GLN	A	208	−10.451	−15.455	−29.142	1.00	33.86
ATOM	1620	CD	GLN	A	208	−9.469	−16.059	−30.126	1.00	38.19
ATOM	1621	OE1	GLN	A	208	−9.686	−15.999	−31.335	1.00	41.96
ATOM	1622	NE2	GLN	A	208	−8.386	−16.633	−29.626	1.00	38.96
ATOM	1623	C	GLN	A	208	−9.765	−16.909	−25.611	1.00	30.45
ATOM	1624	O	GLN	A	208	−10.516	−17.048	−24.658	1.00	30.63
ATOM	1625	N	SER	A	209	−8.451	−16.816	−25.469	1.00	29.96
ATOM	1626	CA	SER	A	209	−7.841	−16.898	−24.160	1.00	30.04
ATOM	1627	CB	SER	A	209	−6.382	−17.343	−24.297	1.00	30.04
ATOM	1628	OG	SER	A	209	−5.763	−17.371	−23.030	1.00	32.75
ATOM	1629	C	SER	A	209	−7.948	−15.564	−23.409	1.00	29.53
ATOM	1630	O	SER	A	209	−7.493	−14.532	−23.908	1.00	29.85
ATOM	1631	N	GLY	A	210	−8.545	−15.594	−22.216	1.00	28.41
ATOM	1632	CA	GLY	A	210	−8.745	−14.388	−21.401	1.00	27.16
ATOM	1633	C	GLY	A	210	−8.344	−14.480	−19.938	1.00	26.83
ATOM	1634	O	GLY	A	210	−8.425	−13.498	−19.203	1.00	26.61
ATOM	1635	N	SER	A	211	−7.888	−15.648	−19.497	1.00	25.85
ATOM	1636	CA	SER	A	211	−7.651	−15.867	−18.067	1.00	25.26
ATOM	1637	CB	SER	A	211	−7.401	−17.353	−17.783	1.00	25.87
ATOM	1638	OG	SER	A	211	−6.315	−17.789	−18.573	1.00	26.62
ATOM	1639	C	SER	A	211	−6.509	−15.026	−17.498	1.00	24.55
ATOM	1640	O	SER	A	211	−6.542	−14.676	−16.311	1.00	24.46
ATOM	1641	N	ALA	A	212	−5.505	−14.712	−18.323	1.00	23.56
ATOM	1642	CA	ALA	A	212	−4.423	−13.816	−17.906	1.00	23.42
ATOM	1643	CB	ALA	A	212	−3.417	−13.622	−19.031	1.00	23.66
ATOM	1644	C	ALA	A	212	−4.999	−12.450	−17.496	1.00	23.54
ATOM	1645	O	ALA	A	212	−4.566	−11.848	−16.513	1.00	24.00
ATOM	1646	N	TYR	A	213	−5.970	−11.979	−18.271	1.00	22.79
ATOM	1647	CA	TYR	A	213	−6.594	−10.676	−18.017	1.00	22.18
ATOM	1648	CB	TYR	A	213	−7.453	−10.241	−19.193	1.00	21.74
ATOM	1649	CG	TYR	A	213	−6.761	−10.345	−20.515	1.00	20.05
ATOM	1650	CD1	TYR	A	213	−7.461	−10.761	−21.637	1.00	20.58
ATOM	1651	CE1	TYR	A	213	−6.854	−10.854	−22.868	1.00	21.95
ATOM	1652	CZ	TYR	A	213	−5.503	−10.545	−22.988	1.00	20.62
ATOM	1653	OH	TYR	A	213	−4.930	−10.668	−24.220	1.00	21.72
ATOM	1654	CE2	TYR	A	213	−4.758	−10.149	−21.888	1.00	19.76
ATOM	1655	CD2	TYR	A	213	−5.400	−10.038	−20.647	1.00	20.61
ATOM	1656	C	TYR	A	213	−7.423	−10.710	−16.758	1.00	23.06
ATOM	1657	O	TYR	A	213	−7.320	−9.804	−15.939	1.00	22.56
ATOM	1658	N	SER	A	214	−8.226	−11.767	−16.578	1.00	23.15
ATOM	1659	CA	SER	A	214	−9.064	−11.832	−15.392	1.00	23.90
ATOM	1660	CB	SER	A	214	−10.244	−12.798	−15.580	1.00	24.54
ATOM	1661	OG	SER	A	214	−9.776	−14.085	−15.939	1.00	27.95
ATOM	1662	C	SER	A	214	−8.259	−12.122	−14.122	1.00	23.64
ATOM	1663	O	SER	A	214	−8.676	−11.762	−13.026	1.00	23.43
ATOM	1664	N	SER	A	215	−7.095	−12.743	−14.248	1.00	23.82
ATOM	1665	CA	SER	A	215	−6.295	−12.970	−13.050	1.00	24.66
ATOM	1666	CB	SER	A	215	−5.390	−14.205	−13.200	1.00	25.70
ATOM	1667	OG	SER	A	215	−4.267	−13.914	−14.004	1.00	29.15
ATOM	1668	C	SER	A	215	−5.491	−11.739	−12.610	1.00	23.98
ATOM	1669	O	SER	A	215	−5.217	−11.561	−11.421	1.00	24.09
ATOM	1670	N	VAL	A	216	−5.115	−10.894	−13.566	1.00	22.89
ATOM	1671	CA	VAL	A	216	−4.347	−9.679	−13.272	1.00	22.50
ATOM	1672	CB	VAL	A	216	−3.442	−9.296	−14.493	1.00	22.52
ATOM	1673	CG1	VAL	A	216	−2.855	−7.888	−14.369	1.00	24.11
ATOM	1674	CG2	VAL	A	216	−2.296	−10.317	−14.652	1.00	22.49
ATOM	1675	C	VAL	A	216	−5.256	−8.520	−12.801	1.00	21.88
ATOM	1676	O	VAL	A	216	−4.869	−7.745	−11.936	1.00	21.84
ATOM	1677	N	ALA	A	217	−6.475	−8.440	−13.332	1.00	21.86
ATOM	1678	CA	ALA	A	217	−7.374	−7.303	−13.050	1.00	21.59

TABLE 15-continued

ATOM	1679	CB	ALA	A	217	−8.721	−7.479	−13.760	1.00	21.26
ATOM	1680	C	ALA	A	217	−7.571	−6.968	−11.558	1.00	21.55
ATOM	1681	O	ALA	A	217	−7.447	−5.804	−11.165	1.00	21.20
ATOM	1682	N	PRO	A	218	−7.842	−7.988	−10.701	1.00	21.95
ATOM	1683	CA	PRO	A	218	−8.030	−7.700	−9.282	1.00	21.59
ATOM	1684	CB	PRO	A	218	−8.283	−9.104	−8.670	1.00	22.29
ATOM	1685	CG	PRO	A	218	−8.789	−9.905	−9.789	1.00	22.61
ATOM	1686	CD	PRO	A	218	−7.966	−9.435	−10.963	1.00	22.11
ATOM	1687	C	PRO	A	218	−6.798	−7.065	−8.634	1.00	21.27
ATOM	1688	O	PRO	A	218	−6.928	−6.299	−7.680	1.00	20.92
ATOM	1689	N	GLN	A	219	−5.608	−7.386	−9.141	1.00	21.17
ATOM	1690	CA	GLN	A	219	−4.378	−6.786	−8.609	1.00	21.51
ATOM	1691	CB	GLN	A	219	−3.149	−7.569	−9.084	1.00	22.72
ATOM	1692	CG	GLN	A	219	−3.113	−8.985	−8.516	1.00	24.90
ATOM	1693	CD	GLN	A	219	−3.323	−8.982	−7.015	1.00	29.57
ATOM	1694	OE1	GLN	A	219	−2.715	−8.188	−6.288	1.00	31.58
ATOM	1695	NE2	GLN	A	219	−4.207	−9.843	−6.545	1.00	33.22
ATOM	1696	C	GLN	A	219	−4.240	−5.301	−8.996	1.00	21.04
ATOM	1697	O	GLN	A	219	−3.687	−4.490	−8.229	1.00	21.07
ATOM	1698	N	VAL	A	220	−4.728	−4.973	−10.187	1.00	20.00
ATOM	1699	CA	VAL	A	220	−4.746	−3.577	−10.630	1.00	19.34
ATOM	1700	CB	VAL	A	220	−5.098	−3.456	−12.128	1.00	19.63
ATOM	1701	CG1	VAL	A	220	−4.991	−2.000	−12.581	1.00	19.15
ATOM	1702	CG2	VAL	A	220	−4.162	−4.342	−12.974	1.00	17.97
ATOM	1703	C	VAL	A	220	−5.730	−2.809	−9.737	1.00	19.65
ATOM	1704	O	VAL	A	220	−5.419	−1.728	−9.257	1.00	18.97
ATOM	1705	N	LEU	A	221	−6.903	−3.391	−9.490	1.00	20.12
ATOM	1706	CA	LEU	A	221	−7.895	−2.776	−8.620	1.00	20.83
ATOM	1707	CB	LEU	A	221	−9.180	−3.602	−8.599	1.00	20.48
ATOM	1708	CG	LEU	A	221	−10.336	−2.991	−7.790	1.00	22.48
ATOM	1709	CD1	LEU	A	221	−10.857	−1.726	−8.458	1.00	22.33
ATOM	1710	CD2	LEU	A	221	−11.430	−4.011	−7.637	1.00	22.51
ATOM	1711	C	LEU	A	221	−7.360	−2.591	−7.192	1.00	21.44
ATOM	1712	O	LEU	A	221	−7.617	−1.578	−6.539	1.00	20.45
ATOM	1713	N	CYS	A	222	−6.600	−3.572	−6.718	1.00	22.60
ATOM	1714	CA	CYS	A	222	−5.957	−3.477	−5.415	1.00	22.10
ATOM	1715	CB	CYS	A	222	−5.159	−4.749	−5.125	1.00	23.41
ATOM	1716	SG	CYS	A	222	−4.975	−5.000	−3.356	1.00	28.49
ATOM	1717	C	CYS	A	222	−5.035	−2.270	−5.317	1.00	21.22
ATOM	1718	O	CYS	A	222	−5.060	−1.531	−4.331	1.00	21.24
ATOM	1719	N	PHE	A	223	−4.210	−2.070	−6.347	1.00	20.11
ATOM	1720	CA	PHE	A	223	−3.287	−0.955	−6.368	1.00	19.03
ATOM	1721	CB	PHE	A	223	−2.334	−1.108	−7.558	1.00	19.15
ATOM	1722	CG	PHE	A	223	−1.297	−0.011	−7.669	1.00	19.23
ATOM	1723	CD1	PHE	A	223	−0.576	0.410	−6.558	1.00	19.90
ATOM	1724	CE1	PHE	A	223	0.380	1.417	−6.661	1.00	20.91
ATOM	1725	CZ	PHE	A	223	0.645	2.017	−7.902	1.00	21.07
ATOM	1726	CE2	PHE	A	223	−0.061	1.598	−9.024	1.00	18.81
ATOM	1727	CD2	PHE	A	223	−1.022	0.581	−8.909	1.00	18.23
ATOM	1728	C	PHE	A	223	−4.032	0.397	−6.423	1.00	18.38
ATOM	1729	O	PHE	A	223	−3.597	1.376	−5.818	1.00	18.27
ATOM	1730	N	LEU	A	224	−5.148	0.428	−7.142	1.00	18.45
ATOM	1731	CA	LEU	A	224	−5.957	1.665	−7.277	1.00	18.42
ATOM	1732	CB	LEU	A	224	−7.208	1.403	−8.127	1.00	17.70
ATOM	1733	CG	LEU	A	224	−7.990	2.645	−8.610	1.00	19.73
ATOM	1734	CD1	LEU	A	224	−7.133	3.427	−9.584	1.00	20.37
ATOM	1735	CD2	LEU	A	224	−9.302	2.228	−9.264	1.00	18.64
ATOM	1736	C	LEU	A	224	−6.385	2.226	−5.917	1.00	18.87
ATOM	1737	O	LEU	A	224	−6.553	3.438	−5.757	1.00	18.45
ATOM	1738	N	GLN	A	225	−6.578	1.336	−4.944	1.00	19.17
ATOM	1739	CA	GLN	A	225	−6.984	1.743	−3.585	1.00	20.00
ATOM	1740	CB	GLN	A	225	−7.340	0.511	−2.725	1.00	20.26
ATOM	1741	CG	GLN	A	225	−8.295	−0.463	−3.409	1.00	21.22
ATOM	1742	CD	GLN	A	225	−9.519	0.225	−3.993	1.00	22.53
ATOM	1743	OE1	GLN	A	225	−10.280	0.870	−3.262	1.00	23.09
ATOM	1744	NE2	GLN	A	225	−9.718	0.092	−5.302	1.00	19.33
ATOM	1745	C	GLN	A	225	−5.944	2.599	−2.871	1.00	20.19
ATOM	1746	O	GLN	A	225	−6.299	3.399	−2.009	1.00	20.64
ATOM	1747	N	ARG	A	226	−4.678	2.450	−3.253	1.00	20.51
ATOM	1748	CA	ARG	A	226	−3.564	3.144	−2.608	1.00	21.40
ATOM	1749	CB	ARG	A	226	−2.219	2.505	−2.990	1.00	22.72
ATOM	1750	CG	ARG	A	226	−2.081	1.010	−2.683	1.00	26.14
ATOM	1751	CD	ARG	A	226	−1.806	0.741	−1.204	1.00	32.16
ATOM	1752	NE	ARG	A	226	−3.035	0.843	−0.432	1.00	37.77
ATOM	1753	CZ	ARG	A	226	−3.997	−0.079	−0.413	1.00	41.09
ATOM	1754	NH1	ARG	A	226	−5.093	0.120	0.322	1.00	42.17
ATOM	1755	NH2	ARG	A	226	−3.874	−1.196	−1.127	1.00	42.78
ATOM	1756	C	ARG	A	226	−3.499	4.645	−2.915	1.00	21.23
ATOM	1757	O	ARG	A	226	−2.723	5.358	−2.288	1.00	20.95
ATOM	1758	N	PHE	A	227	−4.298	5.123	−3.869	1.00	20.28

TABLE 15-continued

ATOM	1759	CA	PHE	A	227	−4.280	6.545	−4.250	1.00	19.67
ATOM	1760	CB	PHE	A	227	−4.777	6.704	−5.693	1.00	19.40
ATOM	1761	CG	PHE	A	227	−3.814	6.195	−6.744	1.00	18.28
ATOM	1762	CD1	PHE	A	227	−3.733	4.831	−7.040	1.00	18.14
ATOM	1763	CE1	PHE	A	227	−2.855	4.355	−8.046	1.00	18.24
ATOM	1764	CZ	PHE	A	227	−2.034	5.264	−8.748	1.00	16.75
ATOM	1765	CE2	PHE	A	227	−2.113	6.641	−8.456	1.00	18.79
ATOM	1766	CD2	PHE	A	227	−3.005	7.091	−7.452	1.00	17.51
ATOM	1767	C	PHE	A	227	−5.126	7.435	−3.343	1.00	20.55
ATOM	1768	O	PHE	A	227	−4.967	8.659	−3.334	1.00	20.38
ATOM	1769	N	TRP	A	228	−6.032	6.820	−2.583	1.00	20.72
ATOM	1770	CA	TRP	A	228	−6.924	7.545	−1.671	1.00	20.71
ATOM	1771	CB	TRP	A	228	−8.036	6.596	−1.211	1.00	20.41
ATOM	1772	CG	TRP	A	228	−9.030	7.228	−0.283	1.00	20.59
ATOM	1773	CD1	TRP	A	228	−9.243	6.915	1.040	1.00	21.81
ATOM	1774	NE1	TRP	A	228	−10.255	7.722	1.557	1.00	22.69
ATOM	1775	CE2	TRP	A	228	−10.712	8.553	0.565	1.00	20.71
ATOM	1776	CD2	TRP	A	228	−9.958	8.280	−0.607	1.00	18.88
ATOM	1777	CE3	TRP	A	228	−10.225	9.014	−1.772	1.00	18.79
ATOM	1778	CZ3	TRP	A	228	−11.209	9.986	−1.734	1.00	20.13
ATOM	1779	CH2	TRP	A	228	−11.937	10.242	−0.552	1.00	21.18
ATOM	1780	CZ2	TRP	A	228	−11.710	9.537	0.601	1.00	21.65
ATOM	1781	C	TRP	A	228	−6.193	8.120	−0.463	1.00	21.38
ATOM	1782	O	TRP	A	228	−5.479	7.394	0.236	1.00	21.50
ATOM	1783	N	VAL	A	229	−6.379	9.416	−0.209	1.00	21.95
ATOM	1784	CA	VAL	A	229	−5.844	10.065	0.983	1.00	22.99
ATOM	1785	CB	VAL	A	229	−5.205	11.436	0.654	1.00	22.81
ATOM	1786	CG1	VAL	A	229	−4.490	12.026	1.871	1.00	23.48
ATOM	1787	CG2	VAL	A	229	−4.226	11.292	−0.493	1.00	23.28
ATOM	1788	C	VAL	A	229	−6.984	10.206	2.000	1.00	24.08
ATOM	1789	O	VAL	A	229	−7.803	11.119	1.899	1.00	23.70
ATOM	1790	N	SER	A	230	−7.044	9.298	2.974	1.00	25.37
ATOM	1791	CA	SER	A	230	−8.193	9.290	3.905	1.00	27.59
ATOM	1792	CB	SER	A	230	−8.254	8.000	4.728	1.00	27.67
ATOM	1793	OG	SER	A	230	−7.029	7.805	5.402	1.00	31.30
ATOM	1794	C	SER	A	230	−8.241	10.513	4.820	1.00	27.93
ATOM	1795	O	SER	A	230	−9.321	10.983	5.174	1.00	28.91
ATOM	1796	N	SER	A	231	−7.088	11.059	5.165	1.00	28.76
ATOM	1797	CA	SER	A	231	−7.059	12.237	6.030	1.00	29.72
ATOM	1798	CB	SER	A	231	−5.671	12.461	6.639	1.00	30.39
ATOM	1799	OG	SER	A	231	−4.703	12.713	5.635	1.00	34.43
ATOM	1800	C	SER	A	231	−7.566	13.491	5.323	1.00	29.39
ATOM	1801	O	SER	A	231	−8.154	14.364	5.966	1.00	30.97
ATOM	1802	N	GLY	A	232	−7.373	13.579	4.005	1.00	27.59
ATOM	1803	CA	GLY	A	232	−7.867	14.728	3.247	1.00	25.22
ATOM	1804	C	GLY	A	232	−9.181	14.518	2.493	1.00	23.25
ATOM	1805	O	GLY	A	232	−9.810	15.487	2.077	1.00	23.19
ATOM	1806	N	GLY	A	233	−9.589	13.265	2.320	1.00	20.97
ATOM	1807	CA	GLY	A	233	−10.809	12.937	1.578	1.00	19.35
ATOM	1808	C	GLY	A	233	−10.673	13.226	0.094	1.00	18.83
ATOM	1809	O	GLY	A	233	−11.636	13.655	−0.561	1.00	19.20
ATOM	1810	N	TYR	A	234	−9.487	12.977	−0.463	1.00	17.56
ATOM	1811	CA	TYR	A	234	−9.309	13.155	−1.915	1.00	17.17
ATOM	1812	CB	TYR	A	234	−8.851	14.584	−2.232	1.00	18.33
ATOM	1813	CG	TYR	A	234	−7.441	14.876	−1.758	1.00	20.39
ATOM	1814	CD1	TYR	A	234	−7.203	15.340	−0.454	1.00	20.72
ATOM	1815	CE1	TYR	A	234	−5.905	15.594	−0.018	1.00	24.11
ATOM	1816	CZ	TYR	A	234	−4.840	15.399	−0.897	1.00	23.78
ATOM	1817	OH	TYR	A	234	−3.556	15.663	−0.483	1.00	26.50
ATOM	1818	CE2	TYR	A	234	−5.055	14.956	−2.187	1.00	24.07
ATOM	1819	CD2	TYR	A	234	−6.353	14.699	−2.611	1.00	20.58
ATOM	1820	C	TYR	A	234	−8.318	12.141	−2.482	1.00	16.60
ATOM	1821	O	TYR	A	234	−7.615	11.465	−1.735	1.00	16.29
ATOM	1822	N	VAL	A	235	−8.260	12.059	−3.805	1.00	15.36
ATOM	1823	CA	VAL	A	235	−7.325	11.164	−4.472	1.00	15.62
ATOM	1824	CB	VAL	A	235	−7.948	10.638	−5.798	1.00	15.96
ATOM	1825	CG1	VAL	A	235	−6.889	9.893	−6.645	1.00	17.31
ATOM	1826	CG2	VAL	A	235	−9.134	9.723	−5.506	1.00	15.87
ATOM	1827	C	VAL	A	235	−6.011	11.904	−4.742	1.00	15.54
ATOM	1828	O	VAL	A	235	−6.006	12.998	−5.320	1.00	15.39
ATOM	1829	N	ASP	A	236	−4.886	11.316	−4.325	1.00	15.24
ATOM	1830	CA	ASP	A	236	−3.580	11.837	−4.705	1.00	15.22
ATOM	1831	CB	ASP	A	236	−2.533	11.431	−3.652	1.00	16.45
ATOM	1832	CG	ASP	A	236	−1.145	11.922	−3.970	1.00	18.62
ATOM	1833	OD1	ASP	A	236	−0.937	12.617	−4.992	1.00	17.17
ATOM	1834	OD2	ASP	A	236	−0.223	11.568	−3.182	1.00	22.79
ATOM	1835	C	ASP	A	236	−3.303	11.256	−6.098	1.00	15.06
ATOM	1836	O	ASP	A	236	−3.088	10.040	−6.261	1.00	15.39
ATOM	1837	N	SER	A	237	−3.384	12.104	−7.125	1.00	14.24
ATOM	1838	CA	SER	A	237	−3.518	11.587	−8.503	1.00	14.09

TABLE 15-continued

ATOM	1839	CB	SER	A	237	−4.000	12.697	−9.446	1.00	13.76
ATOM	1840	OG	SER	A	237	−5.312	13.094	−9.070	1.00	14.52
ATOM	1841	C	SER	A	237	−2.277	10.883	−9.053	1.00	14.22
ATOM	1842	O	SER	A	237	−2.376	10.067	−9.965	1.00	13.80
ATOM	1843	N	ASN	A	238	−1.099	11.219	−8.521	1.00	14.70
ATOM	1844	CA	ASN	A	238	0.116	10.547	−8.952	1.00	15.28
ATOM	1845	CB	ASN	A	238	0.968	11.439	−9.856	1.00	14.84
ATOM	1846	CG	ASN	A	238	0.277	11.742	−11.176	1.00	17.08
ATOM	1847	OD1	ASN	A	238	0.244	10.901	−12.072	1.00	16.61
ATOM	1848	ND2	ASN	A	238	−0.308	12.932	−11.278	1.00	16.63
ATOM	1849	C	ASN	A	238	0.912	10.150	−7.736	1.00	16.07
ATOM	1850	O	ASN	A	238	1.169	10.988	−6.890	1.00	15.88
ATOM	1851	N	ILE	A	239	1.280	8.875	−7.659	1.00	16.09
ATOM	1852	CA	ILE	A	239	2.125	8.410	−6.567	1.00	18.07
ATOM	1853	CB	ILE	A	239	1.340	7.452	−5.600	1.00	17.66
ATOM	1854	CG1	ILE	A	239	0.893	6.180	−6.336	1.00	18.85
ATOM	1855	CD1	ILE	A	239	0.184	5.109	−5.437	1.00	19.02
ATOM	1856	CG2	ILE	A	239	0.116	8.194	−4.974	1.00	16.96
ATOM	1857	C	ILE	A	239	3.381	7.760	−7.169	1.00	19.32
ATOM	1858	O	ILE	A	239	3.571	7.797	−8.392	1.00	19.19
ATOM	1859	N	ASN	A	240	4.242	7.170	−6.329	1.00	20.56
ATOM	1860	CA	ASN	A	240	5.517	6.617	−6.823	1.00	22.24
ATOM	1861	CB	ASN	A	240	5.275	5.385	−7.717	1.00	21.93
ATOM	1862	CG	ASN	A	240	4.874	4.153	−6.926	1.00	24.19
ATOM	1863	OD1	ASN	A	240	5.269	3.995	−5.772	1.00	25.98
ATOM	1864	ND2	ASN	A	240	4.083	3.278	−7.538	1.00	22.26
ATOM	1865	C	ASN	A	240	6.334	7.677	−7.571	1.00	23.27
ATOM	1866	O	ASN	A	240	7.000	7.381	−8.562	1.00	23.15
ATOM	1867	N	THR	A	241	6.261	8.919	−7.096	1.00	25.02
ATOM	1868	CA	THR	A	241	6.939	10.038	−7.729	1.00	28.12
ATOM	1869	CB	THR	A	241	6.044	10.720	−8.817	1.00	28.09
ATOM	1870	OG1	THR	A	241	6.741	11.836	−9.369	1.00	28.75
ATOM	1871	CG2	THR	A	241	4.727	11.208	−8.231	1.00	28.30
ATOM	1872	C	THR	A	241	7.302	11.065	−6.674	1.00	29.96
ATOM	1873	O	THR	A	241	6.749	11.037	−5.589	1.00	30.58
ATOM	1874	N	ASN	A	242	8.209	11.984	−6.991	1.00	33.17
ATOM	1875	CA	ASN	A	242	8.585	13.019	−6.024	1.00	36.07
ATOM	1876	CB	ASN	A	242	10.059	12.880	−5.616	1.00	37.13
ATOM	1877	CG	ASN	A	242	10.324	11.631	−4.771	1.00	40.96
ATOM	1878	OD1	ASN	A	242	9.509	11.235	−3.921	1.00	45.33
ATOM	1879	ND2	ASN	A	242	11.477	11.007	−4.998	1.00	44.43
ATOM	1880	C	ASN	A	242	8.321	14.427	−6.528	1.00	37.00
ATOM	1881	O	ASN	A	242	9.091	15.346	−6.245	1.00	37.94
ATOM	1882	N	GLU	A	243	7.210	14.602	−7.233	1.00	37.54
ATOM	1883	CA	GLU	A	243	6.895	15.869	−7.907	1.00	38.05
ATOM	1884	CB	GLU	A	243	5.775	15.638	−8.925	1.00	38.77
ATOM	1885	CG	GLU	A	243	5.650	16.732	−9.977	1.00	42.65
ATOM	1886	CD	GLU	A	243	6.959	16.985	−10.709	1.00	47.49
ATOM	1887	OE1	GLU	A	243	7.424	16.084	−11.453	1.00	49.14
ATOM	1888	OE2	GLU	A	243	7.520	18.090	−10.532	1.00	50.15
ATOM	1889	C	GLU	A	243	6.559	17.088	−7.015	1.00	37.15
ATOM	1890	O	GLU	A	243	6.645	18.240	−7.469	1.00	38.39
ATOM	1891	N	GLY	A	244	6.174	16.873	−5.766	1.00	35.69
ATOM	1892	CA	GLY	A	244	5.858	18.019	−4.911	1.00	33.51
ATOM	1893	C	GLY	A	244	4.609	18.775	−5.369	1.00	31.80
ATOM	1894	O	GLY	A	244	4.634	19.999	−5.535	1.00	33.32
ATOM	1895	N	ARG	A	245	3.529	18.036	−5.612	1.00	27.92
ATOM	1896	CA	ARG	A	245	2.200	18.618	−5.781	1.00	24.21
ATOM	1897	CB	ARG	A	245	1.638	18.224	−7.130	1.00	24.30
ATOM	1898	CG	ARG	A	245	2.410	18.842	−8.275	1.00	24.62
ATOM	1899	CD	ARG	A	245	1.625	18.681	−9.532	1.00	22.11
ATOM	1900	NE	ARG	A	245	2.462	18.829	−10.713	1.00	21.13
ATOM	1901	CZ	ARG	A	245	2.114	18.302	−11.878	1.00	21.50
ATOM	1902	NH1	ARG	A	245	0.982	17.621	−11.945	1.00	18.57
ATOM	1903	NH2	ARG	A	245	2.883	18.443	−12.951	1.00	20.83
ATOM	1904	C	ARG	A	245	1.295	18.040	−4.718	1.00	21.84
ATOM	1905	O	ARG	A	245	1.624	17.021	−4.128	1.00	20.65
ATOM	1906	N	THR	A	246	0.140	18.652	−4.483	1.00	19.15
ATOM	1907	CA	THR	A	246	−0.824	18.058	−3.540	1.00	17.46
ATOM	1908	CB	THR	A	246	−1.989	18.997	−3.238	1.00	17.87
ATOM	1909	OG1	THR	A	246	−2.752	19.155	−4.440	1.00	15.85
ATOM	1910	CG2	THR	A	246	−1.495	20.370	−2.730	1.00	17.50
ATOM	1911	C	THR	A	246	−1.426	16.769	−4.103	1.00	17.25
ATOM	1912	O	THR	A	246	−1.884	15.914	−3.351	1.00	17.57
ATOM	1913	N	GLY	A	247	−1.482	16.646	−5.430	1.00	15.60
ATOM	1914	CA	GLY	A	247	−2.148	15.492	−6.054	1.00	15.02
ATOM	1915	C	GLY	A	247	−3.609	15.761	−6.396	1.00	14.69
ATOM	1916	O	GLY	A	247	−4.260	14.939	−7.059	1.00	14.45
ATOM	1917	N	LYS	A	248	−4.137	16.890	−5.928	1.00	13.43
ATOM	1918	CA	LYS	A	248	−5.508	17.286	−6.259	1.00	13.00

TABLE 15-continued

ATOM	1919	CB	LYS	A	248	−5.969	18.453	−5.396	1.00	12.32
ATOM	1920	CG	LYS	A	248	−5.965	18.179	−3.881	1.00	13.12
ATOM	1921	CD	LYS	A	248	−6.133	19.493	−3.102	1.00	14.08
ATOM	1922	CE	LYS	A	248	−5.985	19.253	−1.584	1.00	17.84
ATOM	1923	NZ	LYS	A	248	−6.335	20.492	−0.835	1.00	16.74
ATOM	1924	C	LYS	A	248	−5.490	17.713	−7.736	1.00	12.73
ATOM	1925	O	LYS	A	248	−4.866	18.707	−8.104	1.00	12.75
ATOM	1926	N	ASP	A	249	−6.185	16.964	−8.580	1.00	11.92
ATOM	1927	CA	ASP	A	249	−5.958	17.098	−10.024	1.00	11.16
ATOM	1928	CB	ASP	A	249	−4.761	16.199	−10.385	1.00	10.83
ATOM	1929	CG	ASP	A	249	−4.268	16.349	−11.831	1.00	12.54
ATOM	1930	OD1	ASP	A	249	−5.078	16.422	−12.785	1.00	11.42
ATOM	1931	OD2	ASP	A	249	−3.025	16.342	−12.001	1.00	13.30
ATOM	1932	C	ASP	A	249	−7.232	16.577	−10.662	1.00	11.38
ATOM	1933	O	ASP	A	249	−7.774	15.542	−10.236	1.00	10.86
ATOM	1934	N	VAL	A	250	−7.700	17.265	−11.703	1.00	11.28
ATOM	1935	CA	VAL	A	250	−8.885	16.793	−12.438	1.00	11.59
ATOM	1936	CB	VAL	A	250	−9.366	17.859	−13.493	1.00	12.49
ATOM	1937	CG1	VAL	A	250	−8.480	17.815	−14.728	1.00	13.03
ATOM	1938	CG2	VAL	A	250	−10.859	17.654	−13.852	1.00	13.75
ATOM	1939	C	VAL	A	250	−8.711	15.386	−13.064	1.00	11.77
ATOM	1940	O	VAL	A	250	−9.698	14.750	−13.467	1.00	11.71
ATOM	1941	N	ASN	A	251	−7.461	14.925	−13.168	1.00	10.73
ATOM	1942	CA	ASN	A	251	−7.131	13.491	−13.378	1.00	11.20
ATOM	1943	CB	ASN	A	251	−5.699	13.265	−12.813	1.00	10.94
ATOM	1944	CG	ASN	A	251	−5.221	11.810	−12.892	1.00	11.58
ATOM	1945	OD1	ASN	A	251	−5.986	10.864	−12.672	1.00	12.47
ATOM	1946	ND2	ASN	A	251	−3.898	11.639	−13.164	1.00	14.40
ATOM	1947	C	ASN	A	251	−8.151	12.560	−12.706	1.00	10.99
ATOM	1948	O	ASN	A	251	−8.755	11.706	−13.355	1.00	11.49
ATOM	1949	N	SER	A	252	−8.407	12.774	−11.417	1.00	11.45
ATOM	1950	CA	SER	A	252	−9.293	11.876	−10.634	1.00	11.79
ATOM	1951	CB	SER	A	252	−9.062	12.155	−9.149	1.00	13.31
ATOM	1952	OG	SER	A	252	−9.338	13.524	−8.882	1.00	13.41
ATOM	1953	C	SER	A	252	−10.784	12.002	−10.996	1.00	11.39
ATOM	1954	O	SER	A	252	−11.532	11.023	−10.964	1.00	12.69
ATOM	1955	N	VAL	A	253	−11.199	13.203	−11.383	1.00	10.56
ATOM	1956	CA	VAL	A	253	−12.582	13.459	−11.821	1.00	10.70
ATOM	1957	CB	VAL	A	253	−12.884	15.004	−11.856	1.00	11.02
ATOM	1958	CG1	VAL	A	253	−14.335	15.262	−12.345	1.00	11.24
ATOM	1959	CG2	VAL	A	253	−12.711	15.585	−10.449	1.00	10.91
ATOM	1960	C	VAL	A	253	−12.810	12.827	−13.187	1.00	11.38
ATOM	1961	O	VAL	A	253	−13.824	12.143	−13.407	1.00	11.69
ATOM	1962	N	LEU	A	254	−11.866	13.059	−14.108	1.00	11.32
ATOM	1963	CA	LEU	A	254	−11.891	12.393	−15.417	1.00	12.12
ATOM	1964	CB	LEU	A	254	−10.635	12.759	−16.238	1.00	11.95
ATOM	1965	CG	LEU	A	254	−10.634	14.202	−16.763	1.00	12.23
ATOM	1966	CD1	LEU	A	254	−9.266	14.564	−17.330	1.00	12.77
ATOM	1967	CD2	LEU	A	254	−11.714	14.371	−17.845	1.00	15.26
ATOM	1968	C	LEU	A	254	−11.963	10.872	−15.271	1.00	12.22
ATOM	1969	O	LEU	A	254	−12.675	10.201	−16.024	1.00	12.01
ATOM	1970	N	THR	A	255	−11.208	10.338	−14.315	1.00	11.58
ATOM	1971	CA	THR	A	255	−11.219	8.913	−14.042	1.00	12.53
ATOM	1972	CB	THR	A	255	−10.267	8.552	−12.890	1.00	12.83
ATOM	1973	OG1	THR	A	255	−8.935	8.933	−13.240	1.00	13.00
ATOM	1974	CG2	THR	A	255	−10.300	7.035	−12.634	1.00	15.06
ATOM	1975	C	THR	A	255	−12.632	8.448	−13.705	1.00	13.12
ATOM	1976	O	THR	A	255	−13.131	7.467	−14.285	1.00	13.49
ATOM	1977	N	SER	A	256	−13.289	9.158	−12.790	1.00	13.46
ATOM	1978	CA	SER	A	256	−14.641	8.781	−12.343	1.00	12.85
ATOM	1979	CB	SER	A	256	−15.152	9.760	−11.282	1.00	13.40
ATOM	1980	OG	SER	A	256	−16.332	9.252	−10.674	1.00	16.69
ATOM	1981	C	SER	A	256	−15.610	8.705	−13.518	1.00	13.13
ATOM	1982	O	SER	A	256	−16.360	7.711	−13.654	1.00	13.10
ATOM	1983	N	ILE	A	257	−15.594	9.728	−14.377	1.00	12.32
ATOM	1984	CA	ILE	A	257	−16.523	9.784	−15.513	1.00	12.32
ATOM	1985	CB	ILE	A	257	−16.747	11.215	−16.072	1.00	11.55
ATOM	1986	CG1	ILE	A	257	−15.482	11.773	−16.764	1.00	11.38
ATOM	1987	CD1	ILE	A	257	−15.699	13.143	−17.441	1.00	13.23
ATOM	1988	CG2	ILE	A	257	−17.257	12.166	−14.942	1.00	13.70
ATOM	1989	C	ILE	A	257	−16.220	8.795	−16.653	1.00	12.79
ATOM	1990	O	ILE	A	257	−17.150	8.319	−17.338	1.00	13.25
ATOM	1991	N	HIS	A	258	−14.941	8.487	−16.855	1.00	12.71
ATOM	1992	CA	HIS	A	258	−14.565	7.566	−17.931	1.00	13.41
ATOM	1993	CB	HIS	A	258	−13.194	7.947	−18.498	1.00	12.06
ATOM	1994	CG	HIS	A	258	−13.268	9.175	−19.341	1.00	13.92
ATOM	1995	ND1	HIS	A	258	−13.942	9.196	−20.547	1.00	16.01
ATOM	1996	CE1	HIS	A	258	−13.891	10.421	−21.047	1.00	18.57
ATOM	1997	NE2	HIS	A	258	−13.256	11.199	−20.189	1.00	14.08
ATOM	1998	CD2	HIS	A	258	−12.861	10.449	−19.108	1.00	13.51

TABLE 15-continued

ATOM	1999	C	HIS	A	258	−14.649	6.091	−17.565	1.00	14.12
ATOM	2000	O	HIS	A	258	−14.645	5.239	−18.454	1.00	14.90
ATOM	2001	N	THR	A	259	−14.752	5.801	−16.274	1.00	13.93
ATOM	2002	CA	THR	A	259	−15.034	4.420	−15.807	1.00	14.91
ATOM	2003	CB	THR	A	259	−13.933	3.856	−14.899	1.00	14.46
ATOM	2004	OG1	THR	A	259	−13.788	4.647	−13.705	1.00	15.66
ATOM	2005	CG2	THR	A	259	−12.589	3.802	−15.677	1.00	15.81
ATOM	2006	C	THR	A	259	−16.433	4.248	−15.173	1.00	14.21
ATOM	2007	O	THR	A	259	−16.709	3.235	−14.546	1.00	14.95
ATOM	2008	N	PHE	A	260	−17.290	5.238	−15.367	1.00	14.76
ATOM	2009	CA	PHE	A	260	−18.691	5.194	−14.926	1.00	15.13
ATOM	2010	CB	PHE	A	260	−19.377	6.492	−15.379	1.00	15.81
ATOM	2011	CG	PHE	A	260	−20.886	6.508	−15.228	1.00	15.47
ATOM	2012	CD1	PHE	A	260	−21.505	6.188	−14.015	1.00	17.59
ATOM	2013	CE1	PHE	A	260	−22.903	6.259	−13.898	1.00	19.11
ATOM	2014	CZ	PHE	A	260	−23.682	6.653	−14.991	1.00	17.18
ATOM	2015	CE2	PHE	A	260	−23.082	6.994	−16.178	1.00	18.04
ATOM	2016	CD2	PHE	A	260	−21.679	6.917	−16.296	1.00	17.22
ATOM	2017	C	PHE	A	260	−19.436	3.977	−15.475	1.00	15.55
ATOM	2018	O	PHE	A	260	−19.426	3.725	−16.684	1.00	15.81
ATOM	2019	N	ASP	A	261	−20.093	3.235	−14.586	1.00	15.51
ATOM	2020	CA	ASP	A	261	−21.008	2.176	−15.006	1.00	16.05
ATOM	2021	CB	ASP	A	261	−20.303	0.813	−15.015	1.00	16.46
ATOM	2022	CG	ASP	A	261	−21.205	−0.321	−15.490	1.00	17.60
ATOM	2023	OD1	ASP	A	261	−22.440	−0.122	−15.579	1.00	18.97
ATOM	2024	OD2	ASP	A	261	−20.656	−1.404	−15.810	1.00	18.29
ATOM	2025	C	ASP	A	261	−22.117	2.185	−13.972	1.00	16.30
ATOM	2026	O	ASP	A	261	−21.882	1.809	−12.840	1.00	15.53
ATOM	2027	N	PRO	A	262	−23.320	2.610	−14.374	1.00	18.21
ATOM	2028	CA	PRO	A	262	−24.438	2.716	−13.412	1.00	20.39
ATOM	2029	CB	PRO	A	262	−25.589	3.308	−14.247	1.00	20.43
ATOM	2030	CG	PRO	A	262	−25.235	3.044	−15.669	1.00	20.06
ATOM	2031	CD	PRO	A	262	−23.709	2.994	−15.734	1.00	17.40
ATOM	2032	C	PRO	A	262	−24.815	1.382	−12.753	1.00	22.31
ATOM	2033	O	PRO	A	262	−25.356	1.374	−11.622	1.00	22.24
ATOM	2034	N	ASN	A	263	−24.508	0.267	−13.421	1.00	22.99
ATOM	2035	CA	ASN	A	263	−24.750	−1.048	−12.838	1.00	25.42
ATOM	2036	CB	ASN	A	263	−24.574	−2.149	−13.890	1.00	26.62
ATOM	2037	CG	ASN	A	263	−25.680	−2.128	−14.948	1.00	30.74
ATOM	2038	OD1	ASN	A	263	−26.688	−1.419	−14.814	1.00	35.92
ATOM	2039	ND2	ASN	A	263	−25.490	−2.906	−16.007	1.00	35.87
ATOM	2040	C	ASN	A	263	−23.894	−1.316	−11.598	1.00	25.45
ATOM	2041	O	ASN	A	263	−24.210	−2.190	−10.795	1.00	26.56
ATOM	2042	N	LEU	A	264	−22.835	−0.529	−11.413	1.00	24.54
ATOM	2043	CA	LEU	A	264	−22.022	−0.616	−10.213	1.00	24.27
ATOM	2044	CB	LEU	A	264	−20.549	−0.287	−10.520	1.00	24.43
ATOM	2045	CG	LEU	A	264	−19.752	−1.346	−11.288	1.00	25.38
ATOM	2046	CD1	LEU	A	264	−18.375	−0.809	−11.659	1.00	26.05
ATOM	2047	CD2	LEU	A	264	−19.619	−2.672	−10.523	1.00	26.24
ATOM	2048	C	LEU	A	264	−22.542	0.273	−9.066	1.00	23.47
ATOM	2049	O	LEU	A	264	−21.956	0.292	−7.988	1.00	23.97
ATOM	2050	N	GLY	A	265	−23.631	1.000	−9.292	1.00	23.32
ATOM	2051	CA	GLY	A	265	−24.218	1.840	−8.237	1.00	22.74
ATOM	2052	C	GLY	A	265	−23.204	2.843	−7.729	1.00	21.84
ATOM	2053	O	GLY	A	265	−22.416	3.373	−8.510	1.00	22.83
ATOM	2054	N	CYS	A	266	−23.175	3.086	−6.424	1.00	21.37
ATOM	2055	CA	CYS	A	266	−22.233	4.073	−5.883	1.00	21.00
ATOM	2056	CB	CYS	A	266	−22.947	5.049	−4.936	1.00	20.86
ATOM	2057	SG	CYS	A	266	−24.347	5.912	−5.711	1.00	20.96
ATOM	2058	C	CYS	A	266	−20.992	3.427	−5.275	1.00	20.98
ATOM	2059	O	CYS	A	266	−20.513	3.814	−4.203	1.00	21.01
ATOM	2060	N	ASP	A	267	−20.462	2.443	−6.002	1.00	20.39
ATOM	2061	CA	ASP	A	267	−19.303	1.686	−5.577	1.00	20.67
ATOM	2062	CB	ASP	A	267	−18.961	0.621	−6.618	1.00	20.84
ATOM	2063	CG	ASP	A	267	−17.666	−0.101	−6.288	1.00	24.28
ATOM	2064	OD1	ASP	A	267	−16.852	−0.322	−7.200	1.00	25.84
ATOM	2065	OD2	ASP	A	267	−17.455	−0.407	−5.098	1.00	27.46
ATOM	2066	C	ASP	A	267	−18.072	2.567	−5.391	1.00	19.78
ATOM	2067	O	ASP	A	267	−17.593	3.161	−6.353	1.00	18.61
ATOM	2068	N	ALA	A	268	−17.544	2.621	−4.174	1.00	18.35
ATOM	2069	CA	ALA	A	268	−16.315	3.395	−3.944	1.00	19.35
ATOM	2070	CB	ALA	A	268	−16.207	3.868	−2.472	1.00	19.46
ATOM	2071	C	ALA	A	268	−15.017	2.701	−4.415	1.00	19.46
ATOM	2072	O	ALA	A	268	−14.009	3.371	−4.665	1.00	19.42
ATOM	2073	N	GLY	A	269	−15.029	1.370	−4.534	1.00	19.01
ATOM	2074	CA	GLY	A	269	−13.826	0.644	−4.936	1.00	19.17
ATOM	2075	C	GLY	A	269	−13.370	1.032	−6.343	1.00	18.75
ATOM	2076	O	GLY	A	269	−12.175	1.134	−6.624	1.00	19.54
ATOM	2077	N	THR	A	270	−14.330	1.257	−7.230	1.00	17.92
ATOM	2078	CA	THR	A	270	−14.016	1.662	−8.594	1.00	18.35

TABLE 15-continued

ATOM	2079	CB	THR	A	270	−14.852	0.882	−9.616	1.00	18.43
ATOM	2080	OG1	THR	A	270	−16.246	1.085	−9.350	1.00	18.51
ATOM	2081	CG2	THR	A	270	−14.529	−0.626	−9.555	1.00	19.75
ATOM	2082	C	THR	A	270	−14.261	3.172	−8.771	1.00	18.25
ATOM	2083	O	THR	A	270	−14.326	3.674	−9.904	1.00	17.88
ATOM	2084	N	PHE	A	271	−14.434	3.880	−7.650	1.00	17.17
ATOM	2085	CA	PHE	A	271	−14.531	5.359	−7.656	1.00	17.38
ATOM	2086	CB	PHE	A	271	−13.183	5.965	−8.121	1.00	17.67
ATOM	2087	CG	PHE	A	271	−12.946	7.376	−7.673	1.00	21.97
ATOM	2088	CD1	PHE	A	271	−12.656	7.653	−6.337	1.00	24.90
ATOM	2089	CE1	PHE	A	271	−12.447	8.981	−5.923	1.00	24.46
ATOM	2090	CZ	PHE	A	271	−12.474	10.043	−6.863	1.00	23.20
ATOM	2091	CE2	PHE	A	271	−12.733	9.783	−8.196	1.00	21.92
ATOM	2092	CD2	PHE	A	271	−12.956	8.436	−8.599	1.00	24.30
ATOM	2093	C	PHE	A	271	−15.677	5.856	−8.551	1.00	16.63
ATOM	2094	O	PHE	A	271	−15.479	6.764	−9.358	1.00	15.93
ATOM	2095	N	GLN	A	272	−16.861	5.249	−8.439	1.00	15.21
ATOM	2096	CA	GLN	A	272	−18.011	5.673	−9.251	1.00	14.97
ATOM	2097	CB	GLN	A	272	−19.227	4.755	−9.013	1.00	14.93
ATOM	2098	CG	GLN	A	272	−19.021	3.355	−9.615	1.00	16.30
ATOM	2099	CD	GLN	A	272	−18.755	3.413	−11.102	1.00	15.81
ATOM	2100	OE1	GLN	A	272	−19.575	3.909	−11.883	1.00	16.97
ATOM	2101	NE2	GLN	A	272	−17.617	2.861	−11.512	1.00	18.50
ATOM	2102	C	GLN	A	272	−18.402	7.118	−8.929	1.00	14.73
ATOM	2103	O	GLN	A	272	−18.194	7.555	−7.800	1.00	15.60
ATOM	2104	N	PRO	A	273	−18.955	7.859	−9.914	1.00	14.45
ATOM	2105	CA	PRO	A	273	−19.342	9.255	−9.682	1.00	14.57
ATOM	2106	CB	PRO	A	273	−20.157	9.597	−10.927	1.00	14.64
ATOM	2107	CG	PRO	A	273	−19.443	8.767	−12.031	1.00	14.70
ATOM	2108	CD	PRO	A	273	−19.156	7.458	−11.326	1.00	14.10
ATOM	2109	C	PRO	A	273	−20.162	9.542	−8.407	1.00	15.22
ATOM	2110	O	PRO	A	273	−19.910	10.562	−7.752	1.00	15.03
ATOM	2111	N	CYS	A	274	−21.130	8.682	−8.075	1.00	15.76
ATOM	2112	CA	CYS	A	274	−21.926	8.913	−6.853	1.00	16.22
ATOM	2113	CB	CYS	A	274	−23.389	8.489	−7.039	1.00	16.57
ATOM	2114	SG	CYS	A	274	−23.611	6.769	−7.423	1.00	17.39
ATOM	2115	C	CYS	A	274	−21.331	8.281	−5.605	1.00	16.64
ATOM	2116	O	CYS	A	274	−21.958	8.329	−4.529	1.00	16.55
ATOM	2117	N	SER	A	275	−20.137	7.681	−5.715	1.00	15.61
ATOM	2118	CA	SER	A	275	−19.476	7.117	−4.528	1.00	15.81
ATOM	2119	CB	SER	A	275	−18.244	6.253	−4.877	1.00	15.06
ATOM	2120	OG	SER	A	275	−17.144	7.041	−5.315	1.00	14.92
ATOM	2121	C	SER	A	275	−19.097	8.232	−3.545	1.00	16.06
ATOM	2122	O	SER	A	275	−18.818	9.366	−3.949	1.00	14.39
ATOM	2123	N	ASP	A	276	−19.103	7.919	−2.248	1.00	16.42
ATOM	2124	CA	ASP	A	276	−18.731	8.935	−1.271	1.00	16.52
ATOM	2125	CB	ASP	A	276	−19.020	8.511	0.189	1.00	16.27
ATOM	2126	CG	ASP	A	276	−18.244	7.281	0.656	1.00	19.14
ATOM	2127	OD1	ASP	A	276	−18.371	7.001	1.873	1.00	19.62
ATOM	2128	OD2	ASP	A	276	−17.544	6.593	−0.120	1.00	17.10
ATOM	2129	C	ASP	A	276	−17.312	9.469	−1.492	1.00	16.17
ATOM	2130	O	ASP	A	276	−17.084	10.683	−1.415	1.00	15.20
ATOM	2131	N	LYS	A	277	−16.381	8.577	−1.823	1.00	15.43
ATOM	2132	CA	LYS	A	277	−14.994	8.982	−2.115	1.00	15.34
ATOM	2133	CB	LYS	A	277	−14.089	7.763	−2.326	1.00	15.23
ATOM	2134	CG	LYS	A	277	−13.924	6.905	−1.059	1.00	17.01
ATOM	2135	CD	LYS	A	277	−12.752	5.929	−1.204	1.00	21.20
ATOM	2136	CE	LYS	A	277	−12.662	5.017	0.015	1.00	22.94
ATOM	2137	NZ	LYS	A	277	−11.533	4.067	−0.165	1.00	29.19
ATOM	2138	C	LYS	A	277	−14.900	9.915	−3.324	1.00	14.30
ATOM	2139	O	LYS	A	277	−14.152	10.887	−3.288	1.00	14.70
ATOM	2140	N	ALA	A	278	−15.644	9.620	−4.393	1.00	14.45
ATOM	2141	CA	ALA	A	278	−15.588	10.464	−5.605	1.00	13.61
ATOM	2142	CB	ALA	A	278	−16.250	9.775	−6.783	1.00	13.30
ATOM	2143	C	ALA	A	278	−16.210	11.827	−5.357	1.00	13.50
ATOM	2144	O	ALA	A	278	−15.730	12.840	−5.864	1.00	13.02
ATOM	2145	N	LEU	A	279	−17.283	11.855	−4.565	1.00	13.22
ATOM	2146	CA	LEU	A	279	−17.936	13.132	−4.239	1.00	12.92
ATOM	2147	CB	LEU	A	279	−19.323	12.893	−3.625	1.00	13.21
ATOM	2148	CG	LEU	A	279	−20.384	12.358	−4.601	1.00	13.94
ATOM	2149	CD1	LEU	A	279	−21.707	11.969	−3.887	1.00	17.68
ATOM	2150	CD2	LEU	A	279	−20.653	13.319	−5.781	1.00	17.52
ATOM	2151	C	LEU	A	279	−17.065	13.995	−3.348	1.00	12.84
ATOM	2152	O	LEU	A	279	−16.941	15.203	−3.577	1.00	13.54
ATOM	2153	N	SER	A	280	−16.463	13.390	−2.315	1.00	12.45
ATOM	2154	CA	SER	A	280	−15.502	14.106	−1.459	1.00	13.53
ATOM	2155	CB	SER	A	280	−14.951	13.168	−0.364	1.00	13.65
ATOM	2156	OG	SER	A	280	−14.008	13.863	0.468	1.00	15.07
ATOM	2157	C	SER	A	280	−14.332	14.672	−2.285	1.00	14.09
ATOM	2158	O	SER	A	280	−13.925	15.856	−2.130	1.00	13.43

TABLE 15-continued

ATOM	2159	N	ASN	A	281	−13.795	13.830	−3.166	1.00	13.27
ATOM	2160	CA	ASN	A	281	−12.690	14.257	−4.027	1.00	13.19
ATOM	2161	CB	ASN	A	281	−12.239	13.078	−4.888	1.00	12.05
ATOM	2162	CG	ASN	A	281	−11.116	13.455	−5.849	1.00	13.13
ATOM	2163	OD1	ASN	A	281	−9.989	13.637	−5.446	1.00	13.26
ATOM	2164	ND2	ASN	A	281	−11.442	13.573	−7.124	1.00	11.63
ATOM	2165	C	ASN	A	281	−13.096	15.432	−4.933	1.00	12.33
ATOM	2166	O	ASN	A	281	−12.330	16.380	−5.109	1.00	13.49
ATOM	2167	N	LEU	A	282	−14.287	15.355	−5.506	1.00	12.05
ATOM	2168	CA	LEU	A	282	−14.760	16.422	−6.376	1.00	13.21
ATOM	2169	CB	LEU	A	282	−16.147	16.109	−6.949	1.00	12.17
ATOM	2170	CG	LEU	A	282	−16.791	17.216	−7.820	1.00	14.57
ATOM	2171	CD1	LEU	A	282	−16.011	17.378	−9.126	1.00	16.58
ATOM	2172	CD2	LEU	A	282	−18.241	16.863	−8.170	1.00	15.68
ATOM	2173	C	LEU	A	282	−14.739	17.754	−5.638	1.00	12.69
ATOM	2174	O	LEU	A	282	−14.201	18.735	−6.153	1.00	13.45
ATOM	2175	N	LYS	A	283	−15.283	17.791	−4.415	1.00	12.75
ATOM	2176	CA	LYS	A	283	−15.306	19.026	−3.656	1.00	12.89
ATOM	2177	CB	LYS	A	283	−16.079	18.860	−2.334	1.00	12.90
ATOM	2178	CG	LYS	A	283	−15.912	20.089	−1.432	1.00	13.94
ATOM	2179	CD	LYS	A	283	−16.909	20.076	−0.252	1.00	14.67
ATOM	2180	CE	LYS	A	283	−16.530	21.136	0.797	1.00	13.67
ATOM	2181	NZ	LYS	A	283	−16.315	22.489	0.212	1.00	19.03
ATOM	2182	C	LYS	A	283	−13.889	19.537	−3.385	1.00	12.43
ATOM	2183	O	LYS	A	283	−13.612	20.710	−3.556	1.00	12.14
ATOM	2184	N	VAL	A	284	−12.988	18.652	−2.966	1.00	12.02
ATOM	2185	CA	VAL	A	284	−11.624	19.055	−2.633	1.00	12.77
ATOM	2186	CB	VAL	A	284	−10.845	17.875	−2.014	1.00	13.17
ATOM	2187	CG1	VAL	A	284	−9.320	18.169	−1.936	1.00	13.21
ATOM	2188	CG2	VAL	A	284	−11.391	17.557	−0.630	1.00	15.81
ATOM	2189	C	VAL	A	284	−10.927	19.599	−3.881	1.00	12.74
ATOM	2190	O	VAL	A	284	−10.228	20.636	−3.827	1.00	12.21
ATOM	2191	N	VAL	A	285	−11.153	18.927	−5.012	1.00	11.54
ATOM	2192	CA	VAL	A	285	−10.560	19.389	−6.287	1.00	12.35
ATOM	2193	CB	VAL	A	285	−10.694	18.330	−7.425	1.00	12.36
ATOM	2194	CG1	VAL	A	285	−10.316	18.944	−8.813	1.00	12.25
ATOM	2195	CG2	VAL	A	285	−9.795	17.104	−7.140	1.00	13.25
ATOM	2196	C	VAL	A	285	−11.130	20.770	−6.712	1.00	12.08
ATOM	2197	O	VAL	A	285	−10.367	21.696	−6.989	1.00	12.60
ATOM	2198	N	VAL	A	286	−12.452	20.913	−6.728	1.00	11.87
ATOM	2199	CA	VAL	A	286	−13.089	22.196	−7.074	1.00	12.87
ATOM	2200	CB	VAL	A	286	−14.631	22.080	−7.038	1.00	13.01
ATOM	2201	CG1	VAL	A	286	−15.300	23.468	−7.140	1.00	14.31
ATOM	2202	CG2	VAL	A	286	−15.103	21.157	−8.200	1.00	14.42
ATOM	2203	C	VAL	A	286	−12.586	23.324	−6.164	1.00	12.84
ATOM	2204	O	VAL	A	286	−12.206	24.402	−6.635	1.00	13.75
ATOM	2205	N	ASP	A	287	−12.552	23.064	−4.853	1.00	12.85
ATOM	2206	CA	ASP	A	287	−12.116	24.059	−3.870	1.00	13.90
ATOM	2207	CB	ASP	A	287	−12.199	23.506	−2.440	1.00	13.12
ATOM	2208	CG	ASP	A	287	−13.637	23.441	−1.924	1.00	16.00
ATOM	2209	OD1	ASP	A	287	−14.541	24.002	−2.583	1.00	16.20
ATOM	2210	OD2	ASP	A	287	−13.857	22.835	−0.858	1.00	16.76
ATOM	2211	C	ASP	A	287	−10.727	24.564	−4.136	1.00	14.28
ATOM	2212	O	ASP	A	287	−10.425	25.722	−3.841	1.00	15.53
ATOM	2213	N	SER	A	288	−9.862	23.709	−4.677	1.00	14.50
ATOM	2214	CA	SER	A	288	−8.478	24.093	−4.949	1.00	14.58
ATOM	2215	CB	SER	A	288	−7.625	22.843	−5.229	1.00	14.15
ATOM	2216	OG	SER	A	288	−7.758	22.417	−6.565	1.00	13.73
ATOM	2217	C	SER	A	288	−8.326	25.186	−6.038	1.00	14.61
ATOM	2218	O	SER	A	288	−7.274	25.847	−6.143	1.00	14.59
ATOM	2219	N	PHE	A	289	−9.392	25.416	−6.809	1.00	13.99
ATOM	2220	CA	PHE	A	289	−9.419	26.447	−7.831	1.00	14.09
ATOM	2221	CB	PHE	A	289	−9.994	25.882	−9.135	1.00	13.52
ATOM	2222	CG	PHE	A	289	−9.169	24.807	−9.704	1.00	11.38
ATOM	2223	CD1	PHE	A	289	−7.976	25.114	−10.367	1.00	12.17
ATOM	2224	CE1	PHE	A	289	−7.184	24.095	−10.905	1.00	13.93
ATOM	2225	CZ	PHE	A	289	−7.572	22.783	−10.771	1.00	13.96
ATOM	2226	CE2	PHE	A	289	−8.756	22.452	−10.097	1.00	11.77
ATOM	2227	CD2	PHE	A	289	−9.555	23.472	−9.571	1.00	11.08
ATOM	2228	C	PHE	A	289	−10.219	27.698	−7.491	1.00	14.73
ATOM	2229	O	PHE	A	289	−10.092	28.713	−8.189	1.00	14.71
ATOM	2230	N	ARG	A	290	−11.054	27.621	−6.464	1.00	15.09
ATOM	2231	CA	ARG	A	290	−11.953	28.740	−6.140	1.00	16.64
ATOM	2232	CB	ARG	A	290	−12.842	28.401	−4.936	1.00	15.99
ATOM	2233	CG	ARG	A	290	−13.913	27.375	−5.230	1.00	15.65
ATOM	2234	CD	ARG	A	290	−14.821	27.163	−4.012	1.00	16.79
ATOM	2235	NE	ARG	A	290	−15.843	26.172	−4.330	1.00	15.04
ATOM	2236	CZ	ARG	A	290	−16.986	26.470	−4.933	1.00	17.22
ATOM	2237	NH1	ARG	A	290	−17.248	27.734	−5.243	1.00	15.41
ATOM	2238	NH2	ARG	A	290	−17.855	25.511	−5.239	1.00	15.94

TABLE 15-continued

ATOM	2239	C	ARG	A	290	−11.240	30.046	−5.864	1.00	18.04
ATOM	2240	O	ARG	A	290	−11.690	31.125	−6.279	1.00	19.61
ATOM	2241	N	SER	A	291	−10.150	29.984	−5.128	1.00	19.44
ATOM	2242	CA	SER	A	291	−9.571	31.246	−4.667	1.00	21.57
ATOM	2243	CB	SER	A	291	−9.146	31.101	−3.212	1.00	22.18
ATOM	2244	OG	SER	A	291	−7.998	30.284	−3.144	1.00	28.35
ATOM	2245	C	SER	A	291	−8.423	31.762	−5.534	1.00	20.65
ATOM	2246	O	SER	A	291	−7.865	32.851	−5.272	1.00	22.43
ATOM	2247	N	ILE	A	292	−8.066	31.019	−6.576	1.00	19.16
ATOM	2248	CA	ILE	A	292	−6.855	31.367	−7.330	1.00	17.65
ATOM	2249	CB	ILE	A	292	−5.805	30.185	−7.408	1.00	18.07
ATOM	2250	CG1	ILE	A	292	−6.379	28.972	−8.194	1.00	17.67
ATOM	2251	CD1	ILE	A	292	−5.315	27.924	−8.649	1.00	17.27
ATOM	2252	CG2	ILE	A	292	−5.341	29.795	−5.994	1.00	18.29
ATOM	2253	C	ILE	A	292	−7.065	31.973	−8.708	1.00	17.20
ATOM	2254	O	ILE	A	292	−6.136	32.563	−9.251	1.00	16.35
ATOM	2255	N	TYR	A	293	−8.252	31.797	−9.290	1.00	15.85
ATOM	2256	CA	TYR	A	293	−8.509	32.304	−10.648	1.00	15.83
ATOM	2257	CB	TYR	A	293	−9.301	31.270	−11.474	1.00	15.43
ATOM	2258	CG	TYR	A	293	−8.571	30.014	−11.886	1.00	15.10
ATOM	2259	CD1	TYR	A	293	−7.183	29.960	−11.965	1.00	14.38
ATOM	2260	CE1	TYR	A	293	−6.540	28.795	−12.395	1.00	14.38
ATOM	2261	CZ	TYR	A	293	−7.306	27.685	−12.743	1.00	14.90
ATOM	2262	OH	TYR	A	293	−6.700	26.522	−13.158	1.00	15.55
ATOM	2263	CE2	TYR	A	293	−8.670	27.722	−12.671	1.00	15.47
ATOM	2264	CD2	TYR	A	293	−9.298	28.875	−12.255	1.00	13.91
ATOM	2265	C	TYR	A	293	−9.351	33.581	−10.591	1.00	15.69
ATOM	2266	O	TYR	A	293	−10.404	33.594	−9.942	1.00	15.47
ATOM	2267	N	GLY	A	294	−8.892	34.629	−11.276	1.00	14.83
ATOM	2268	CA	GLY	A	294	−9.641	35.899	−11.353	1.00	15.57
ATOM	2269	C	GLY	A	294	−11.078	35.702	−11.858	1.00	15.93
ATOM	2270	O	GLY	A	294	−12.010	36.359	−11.376	1.00	15.66
ATOM	2271	N	VAL	A	295	−11.288	34.773	−12.799	1.00	15.60
ATOM	2272	CA	VAL	A	295	−12.651	34.520	−13.270	1.00	16.24
ATOM	2273	CB	VAL	A	295	−12.753	33.561	−14.501	1.00	16.31
ATOM	2274	CG1	VAL	A	295	−12.170	34.195	−15.740	1.00	16.26
ATOM	2275	CG2	VAL	A	295	−12.128	32.184	−14.199	1.00	16.19
ATOM	2276	C	VAL	A	295	−13.596	34.013	−12.172	1.00	16.97
ATOM	2277	O	VAL	A	295	−14.813	34.108	−12.320	1.00	18.03
ATOM	2278	N	ASN	A	296	−13.047	33.463	−11.092	1.00	16.93
ATOM	2279	CA	ASN	A	296	−13.878	32.920	−10.020	1.00	17.69
ATOM	2280	CB	ASN	A	296	−13.250	31.633	−9.472	1.00	17.57
ATOM	2281	CG	ASN	A	296	−13.296	30.493	−10.482	1.00	16.44
ATOM	2282	OD1	ASN	A	296	−14.158	30.481	−11.356	1.00	17.29
ATOM	2283	ND2	ASN	A	296	−12.401	29.513	−10.336	1.00	15.99
ATOM	2284	C	ASN	A	296	−14.187	33.915	−8.896	1.00	19.30
ATOM	2285	O	ASN	A	296	−14.945	33.601	−7.979	1.00	19.07
ATOM	2286	N	LYS	A	297	−13.617	35.116	−9.007	1.00	20.37
ATOM	2287	CA	LYS	A	297	−13.811	36.203	−8.038	1.00	22.43
ATOM	2288	CB	LYS	A	297	−13.209	37.502	−8.584	1.00	22.90
ATOM	2289	CG	LYS	A	297	−11.741	37.680	−8.316	1.00	30.03
ATOM	2290	CD	LYS	A	297	−11.401	39.189	−8.309	1.00	35.34
ATOM	2291	CE	LYS	A	297	−12.247	39.913	−7.255	1.00	39.86
ATOM	2292	NZ	LYS	A	297	−11.995	41.386	−7.178	1.00	42.72
ATOM	2293	C	LYS	A	297	−15.275	36.453	−7.782	1.00	21.89
ATOM	2294	O	LYS	A	297	−16.061	36.585	−8.712	1.00	21.96
ATOM	2295	N	GLY	A	298	−15.659	36.537	−6.517	1.00	22.72
ATOM	2296	CA	GLY	A	298	−17.050	36.869	−6.219	1.00	22.99
ATOM	2297	C	GLY	A	298	−18.043	35.720	−6.278	1.00	23.54
ATOM	2298	O	GLY	A	298	−19.180	35.885	−5.855	1.00	25.04
ATOM	2299	N	ILE	A	299	−17.647	34.546	−6.784	1.00	22.16
ATOM	2300	CA	ILE	A	299	−18.574	33.393	−6.763	1.00	21.47
ATOM	2301	CB	ILE	A	299	−18.251	32.350	−7.884	1.00	21.22
ATOM	2302	CG1	ILE	A	299	−18.356	32.985	−9.274	1.00	19.64
ATOM	2303	CD1	ILE	A	299	−17.740	32.095	−10.415	1.00	19.76
ATOM	2304	CG2	ILE	A	299	−19.163	31.091	−7.762	1.00	20.54
ATOM	2305	C	ILE	A	299	−18.562	32.740	−5.375	1.00	22.34
ATOM	2306	O	ILE	A	299	−17.486	32.395	−4.861	1.00	22.29
ATOM	2307	N	PRO	A	300	−19.743	32.580	−4.751	1.00	23.04
ATOM	2308	CA	PRO	A	300	−19.791	32.018	−3.392	1.00	23.60
ATOM	2309	CB	PRO	A	300	−21.217	32.364	−2.922	1.00	24.19
ATOM	2310	CG	PRO	A	300	−22.015	32.437	−4.178	1.00	23.80
ATOM	2311	CD	PRO	A	300	−21.085	32.934	−5.253	1.00	23.06
ATOM	2312	C	PRO	A	300	−19.584	30.500	−3.322	1.00	23.50
ATOM	2313	O	PRO	A	300	−19.664	29.810	−4.347	1.00	22.46
ATOM	2314	N	ALA	A	301	−19.325	29.985	−2.116	1.00	22.68
ATOM	2315	CA	ALA	A	301	−19.380	28.549	−1.905	1.00	22.89
ATOM	2316	CB	ALA	A	301	−18.988	28.185	−0.465	1.00	23.54
ATOM	2317	C	ALA	A	301	−20.788	28.074	−2.236	1.00	21.91
ATOM	2318	O	ALA	A	301	−21.759	28.834	−2.108	1.00	23.09

TABLE 15-continued

ATOM	2319	N	GLY	A	302	−20.898	26.838	−2.698	1.00	20.96
ATOM	2320	CA	GLY	A	302	−22.173	26.272	−3.115	1.00	19.69
ATOM	2321	C	GLY	A	302	−22.565	26.637	−4.537	1.00	19.78
ATOM	2322	O	GLY	A	302	−23.661	26.283	−4.991	1.00	19.32
ATOM	2323	N	ALA	A	303	−21.686	27.355	−5.235	1.00	17.97
ATOM	2324	CA	ALA	A	303	−21.948	27.708	−6.635	1.00	17.13
ATOM	2325	CB	ALA	A	303	−22.168	29.212	−6.812	1.00	16.73
ATOM	2326	C	ALA	A	303	−20.784	27.245	−7.481	1.00	16.19
ATOM	2327	O	ALA	A	303	−19.647	27.171	−7.004	1.00	16.23
ATOM	2328	N	ALA	A	304	−21.067	26.956	−8.746	1.00	15.66
ATOM	2329	CA	ALA	A	304	−20.069	26.378	−9.640	1.00	15.10
ATOM	2330	CB	ALA	A	304	−20.750	25.795	−10.860	1.00	15.80
ATOM	2331	C	ALA	A	304	−19.002	27.394	−10.044	1.00	14.74
ATOM	2332	O	ALA	A	304	−19.270	28.587	−10.121	1.00	14.27
ATOM	2333	N	VAL	A	305	−17.783	26.914	−10.300	1.00	14.18
ATOM	2334	CA	VAL	A	305	−16.680	27.783	−10.698	1.00	13.54
ATOM	2335	CB	VAL	A	305	−15.656	27.971	−9.543	1.00	13.42
ATOM	2336	CG1	VAL	A	305	−16.224	28.881	−8.418	1.00	14.25
ATOM	2337	CG2	VAL	A	305	−15.218	26.597	−8.966	1.00	14.99
ATOM	2338	C	VAL	A	305	−15.952	27.141	−11.873	1.00	13.34
ATOM	2339	O	VAL	A	305	−16.121	25.944	−12.126	1.00	12.46
ATOM	2340	N	ALA	A	306	−15.130	27.921	−12.562	1.00	13.38
ATOM	2341	CA	ALA	A	306	−14.233	27.376	−13.573	1.00	14.37
ATOM	2342	CB	ALA	A	306	−13.709	28.504	−14.470	1.00	15.32
ATOM	2343	C	ALA	A	306	−13.082	26.626	−12.938	1.00	14.68
ATOM	2344	O	ALA	A	306	−12.457	27.116	−11.974	1.00	15.21
ATOM	2345	N	ILE	A	307	−12.781	25.452	−13.484	1.00	13.50
ATOM	2346	CA	ILE	A	307	−11.667	24.668	−12.975	1.00	13.67
ATOM	2347	CB	ILE	A	307	−12.134	23.438	−12.163	1.00	14.45
ATOM	2348	CG1	ILE	A	307	−12.756	22.386	−13.072	1.00	15.37
ATOM	2349	CD1	ILE	A	307	−12.921	21.033	−12.368	1.00	19.15
ATOM	2350	CG2	ILE	A	307	−13.119	23.848	−11.005	1.00	15.52
ATOM	2351	C	ILE	A	307	−10.646	24.290	−14.059	1.00	12.52
ATOM	2352	O	ILE	A	307	−10.974	24.232	−15.264	1.00	12.22
ATOM	2353	N	GLY	A	308	−9.405	24.095	−13.604	1.00	11.71
ATOM	2354	CA	GLY	A	308	−8.276	23.737	−14.452	1.00	11.64
ATOM	2355	C	GLY	A	308	−7.853	22.306	−14.199	1.00	11.62
ATOM	2356	O	GLY	A	308	−8.667	21.444	−13.806	1.00	12.05
ATOM	2357	N	ARG	A	309	−6.583	22.026	−14.454	1.00	11.39
ATOM	2358	CA	ARG	A	309	−6.091	20.661	−14.337	1.00	11.23
ATOM	2359	CB	ARG	A	309	−4.896	20.467	−15.275	1.00	11.37
ATOM	2360	CG	ARG	A	309	−5.220	20.697	−16.791	1.00	11.29
ATOM	2361	CD	ARG	A	309	−4.066	20.130	−17.625	1.00	12.62
ATOM	2362	NE	ARG	A	309	−2.845	20.919	−17.425	1.00	12.15
ATOM	2363	CZ	ARG	A	309	−1.701	20.665	−18.047	1.00	15.00
ATOM	2364	NH1	ARG	A	309	−1.630	19.633	−18.910	1.00	12.05
ATOM	2365	NH2	ARG	A	309	−0.624	21.395	−17.778	1.00	13.85
ATOM	2366	C	ARG	A	309	−5.654	20.425	−12.888	1.00	11.83
ATOM	2367	O	ARG	A	309	−6.093	19.481	−12.221	1.00	11.38
ATOM	2368	N	TYR	A	310	−4.806	21.322	−12.399	1.00	11.88
ATOM	2369	CA	TYR	A	310	−4.293	21.215	−11.022	1.00	11.17
ATOM	2370	CB	TYR	A	310	−3.225	20.082	−10.878	1.00	12.49
ATOM	2371	CG	TYR	A	310	−2.065	20.201	−11.844	1.00	13.10
ATOM	2372	CD1	TYR	A	310	−2.128	19.622	−13.138	1.00	12.57
ATOM	2373	CE1	TYR	A	310	−1.069	19.772	−14.039	1.00	15.63
ATOM	2374	CZ	TYR	A	310	0.065	20.475	−13.649	1.00	14.31
ATOM	2375	OH	TYR	A	310	1.119	20.611	−14.529	1.00	14.42
ATOM	2376	CE2	TYR	A	310	0.159	21.030	−12.379	1.00	12.68
ATOM	2377	CD2	TYR	A	310	−0.909	20.906	−11.485	1.00	14.04
ATOM	2378	C	TYR	A	310	−3.779	22.596	−10.644	1.00	12.74
ATOM	2379	O	TYR	A	310	−3.333	23.356	−11.505	1.00	12.44
ATOM	2380	N	ALA	A	311	−3.872	22.945	−9.362	1.00	11.99
ATOM	2381	CA	ALA	A	311	−3.618	24.337	−8.975	1.00	13.33
ATOM	2382	CB	ALA	A	311	−4.084	24.589	−7.508	1.00	12.88
ATOM	2383	C	ALA	A	311	−2.157	24.768	−9.197	1.00	13.50
ATOM	2384	O	ALA	A	311	−1.906	25.951	−9.468	1.00	14.52
ATOM	2385	N	GLU	A	312	−1.216	23.823	−9.140	1.00	13.52
ATOM	2386	CA	GLU	A	312	0.219	24.134	−9.332	1.00	14.23
ATOM	2387	CB	GLU	A	312	1.111	23.020	−8.790	1.00	15.44
ATOM	2388	CG	GLU	A	312	0.933	22.802	−7.303	1.00	16.54
ATOM	2389	CD	GLU	A	312	−0.130	21.762	−6.950	1.00	18.91
ATOM	2390	OE1	GLU	A	312	−0.941	21.338	−7.808	1.00	16.89
ATOM	2391	OE2	GLU	A	312	−0.150	21.345	−5.778	1.00	18.72
ATOM	2392	C	GLU	A	312	0.591	24.380	−10.796	1.00	14.80
ATOM	2393	O	GLU	A	312	1.741	24.736	−11.100	1.00	14.98
ATOM	2394	N	ASP	A	313	−0.374	24.197	−11.697	1.00	13.37
ATOM	2395	CA	ASP	A	313	−0.112	24.258	−13.155	1.00	13.71
ATOM	2396	CB	ASP	A	313	−1.457	24.079	−13.888	1.00	12.88
ATOM	2397	CG	ASP	A	313	−1.320	23.671	−15.343	1.00	14.44
ATOM	2398	OD1	ASP	A	313	−0.197	23.597	−15.900	1.00	13.19

TABLE 15-continued

ATOM	2399	OD2	ASP	A	313	−2.400	23.406	−15.923	1.00	13.61
ATOM	2400	C	ASP	A	313	0.512	25.589	−13.587	1.00	14.00
ATOM	2401	O	ASP	A	313	0.007	26.662	−13.219	1.00	14.35
ATOM	2402	N	VAL	A	314	1.577	25.530	−14.399	1.00	13.84
ATOM	2403	CA	VAL	A	314	2.145	26.747	−14.988	1.00	15.19
ATOM	2404	CB	VAL	A	314	3.602	27.016	−14.520	1.00	16.70
ATOM	2405	CG1	VAL	A	314	3.638	27.295	−13.009	1.00	17.94
ATOM	2406	CG2	VAL	A	314	4.551	25.857	−14.915	1.00	16.69
ATOM	2407	C	VAL	A	314	2.123	26.729	−16.528	1.00	15.30
ATOM	2408	O	VAL	A	314	2.712	27.598	−17.165	1.00	15.13
ATOM	2409	N	TYR	A	315	1.441	25.743	−17.111	1.00	14.51
ATOM	2410	CA	TYR	A	315	1.351	25.634	−18.580	1.00	15.65
ATOM	2411	CB	TYR	A	315	0.768	24.264	−18.957	1.00	15.82
ATOM	2412	CG	TYR	A	315	0.694	23.988	−20.457	1.00	16.29
ATOM	2413	CD1	TYR	A	315	1.824	24.124	−21.265	1.00	17.01
ATOM	2414	CE1	TYR	A	315	1.778	23.859	−22.634	1.00	18.92
ATOM	2415	CZ	TYR	A	315	0.588	23.421	−23.208	1.00	16.14
ATOM	2416	OH	TYR	A	315	0.557	23.164	−24.577	1.00	16.95
ATOM	2417	CE2	TYR	A	315	−0.552	23.261	−22.423	1.00	15.41
ATOM	2418	CD2	TYR	A	315	−0.492	23.539	−21.044	1.00	14.48
ATOM	2419	C	TYR	A	315	0.489	26.777	−19.107	1.00	15.56
ATOM	2420	O	TYR	A	315	−0.688	26.888	−18.748	1.00	16.36
ATOM	2421	N	TYR	A	316	1.072	27.645	−19.944	1.00	16.61
ATOM	2422	CA	TYR	A	316	0.404	28.890	−20.380	1.00	17.53
ATOM	2423	CB	TYR	A	316	−0.778	28.603	−21.337	1.00	18.31
ATOM	2424	CG	TYR	A	316	−0.329	28.321	−22.742	1.00	19.74
ATOM	2425	CD1	TYR	A	316	−0.071	27.026	−23.169	1.00	18.95
ATOM	2426	CE1	TYR	A	316	0.353	26.757	−24.466	1.00	18.69
ATOM	2427	CZ	TYR	A	316	0.551	27.812	−25.342	1.00	21.77
ATOM	2428	OH	TYR	A	316	1.002	27.557	−26.617	1.00	23.75
ATOM	2429	CE2	TYR	A	316	0.329	29.125	−24.932	1.00	22.39
ATOM	2430	CD2	TYR	A	316	−0.111	29.369	−23.639	1.00	21.90
ATOM	2431	C	TYR	A	316	−0.037	29.730	−19.173	1.00	17.87
ATOM	2432	O	TYR	A	316	−0.968	30.517	−19.266	1.00	17.06
ATOM	2433	N	ASN	A	317	0.689	29.555	−18.066	1.00	18.34
ATOM	2434	CA	ASN	A	317	0.483	30.231	−16.766	1.00	19.27
ATOM	2435	CB	ASN	A	317	0.106	31.699	−16.921	1.00	20.01
ATOM	2436	CG	ASN	A	317	1.171	32.489	−17.624	1.00	24.51
ATOM	2437	OD1	ASN	A	317	2.363	32.384	−17.305	1.00	29.46
ATOM	2438	ND2	ASN	A	317	0.756	33.269	−18.603	1.00	29.08
ATOM	2439	C	ASN	A	317	−0.506	29.551	−15.842	1.00	18.28
ATOM	2440	O	ASN	A	317	−0.706	30.001	−14.719	1.00	19.05
ATOM	2441	N	GLY	A	318	−1.114	28.459	−16.300	1.00	17.74
ATOM	2442	CA	GLY	A	318	−2.086	27.721	−15.475	1.00	15.34
ATOM	2443	C	GLY	A	318	−3.458	28.356	−15.550	1.00	15.47
ATOM	2444	O	GLY	A	318	−3.700	29.390	−14.932	1.00	15.75
ATOM	2445	N	ASN	A	319	−4.369	27.733	−16.306	1.00	13.16
ATOM	2446	CA	ASN	A	319	−5.672	28.305	−16.557	1.00	12.74
ATOM	2447	CB	ASN	A	319	−5.693	28.883	−17.980	1.00	12.31
ATOM	2448	CG	ASN	A	319	−4.676	29.979	−18.187	1.00	13.01
ATOM	2449	OD1	ASN	A	319	−4.832	31.117	−17.699	1.00	14.18
ATOM	2450	ND2	ASN	A	319	−3.640	29.665	−18.942	1.00	11.49
ATOM	2451	C	ASN	A	319	−6.799	27.271	−16.442	1.00	12.27
ATOM	2452	O	ASN	A	319	−6.545	26.071	−16.456	1.00	12.28
ATOM	2453	N	PRO	A	320	−8.054	27.732	−16.334	1.00	12.96
ATOM	2454	CA	PRO	A	320	−9.113	26.759	−16.472	1.00	12.58
ATOM	2455	CB	PRO	A	320	−10.395	27.579	−16.324	1.00	13.28
ATOM	2456	CG	PRO	A	320	−10.007	29.011	−16.183	1.00	14.34
ATOM	2457	CD	PRO	A	320	−8.537	29.090	−15.991	1.00	12.66
ATOM	2458	C	PRO	A	320	−9.101	26.090	−17.851	1.00	12.18
ATOM	2459	O	PRO	A	320	−8.643	26.698	−18.820	1.00	11.99
ATOM	2460	N	TRP	A	321	−9.589	24.852	−17.912	1.00	11.79
ATOM	2461	CA	TRP	A	321	−9.739	24.116	−19.154	1.00	11.97
ATOM	2462	CB	TRP	A	321	−8.988	22.775	−19.063	1.00	11.15
ATOM	2463	CG	TRP	A	321	−7.469	22.900	−19.200	1.00	12.16
ATOM	2464	CD1	TRP	A	321	−6.658	23.837	−18.627	1.00	13.28
ATOM	2465	NE1	TRP	A	321	−5.347	23.636	−19.016	1.00	13.24
ATOM	2466	CE2	TRP	A	321	−5.290	22.538	−19.831	1.00	13.51
ATOM	2467	CD2	TRP	A	321	−6.617	22.054	−19.978	1.00	12.68
ATOM	2468	CE3	TRP	A	321	−6.846	20.938	−20.787	1.00	14.41
ATOM	2469	CZ3	TRP	A	321	−5.741	20.323	−21.428	1.00	13.49
ATOM	2470	CH2	TRP	A	321	−4.436	20.819	−21.250	1.00	13.43
ATOM	2471	CZ2	TRP	A	321	−4.193	21.948	−20.479	1.00	14.69
ATOM	2472	C	TRP	A	321	−11.202	23.797	−19.342	1.00	11.99
ATOM	2473	O	TRP	A	321	−11.875	23.448	−18.388	1.00	11.51
ATOM	2474	N	TYR	A	322	−11.696	23.896	−20.579	1.00	11.47
ATOM	2475	CA	TYR	A	322	−13.088	23.511	−20.841	1.00	11.31
ATOM	2476	CB	TYR	A	322	−13.433	23.691	−22.322	1.00	12.14
ATOM	2477	CG	TYR	A	322	−13.352	25.130	−22.793	1.00	12.81
ATOM	2478	CD1	TYR	A	322	−12.260	25.574	−23.509	1.00	11.43

TABLE 15-continued

ATOM	2479	CE1	TYR	A	322	−12.173	26.914	−23.965	1.00	12.91
ATOM	2480	CZ	TYR	A	322	−13.216	27.802	−23.697	1.00	14.27
ATOM	2481	OH	TYR	A	322	−13.127	29.104	−24.146	1.00	15.10
ATOM	2482	CE2	TYR	A	322	−14.324	27.373	−22.982	1.00	13.40
ATOM	2483	CD2	TYR	A	322	−14.378	26.031	−22.522	1.00	11.58
ATOM	2484	C	TYR	A	322	−13.367	22.082	−20.433	1.00	11.31
ATOM	2485	O	TYR	A	322	−14.380	21.795	−19.771	1.00	11.08
ATOM	2486	N	LEU	A	323	−12.480	21.169	−20.814	1.00	10.96
ATOM	2487	CA	LEU	A	323	−12.770	19.750	−20.561	1.00	11.04
ATOM	2488	CB	LEU	A	323	−11.787	18.844	−21.315	1.00	11.26
ATOM	2489	CG	LEU	A	323	−10.314	18.876	−20.903	1.00	10.53
ATOM	2490	CD1	LEU	A	323	−10.074	17.902	−19.745	1.00	14.57
ATOM	2491	CD2	LEU	A	323	−9.474	18.437	−22.112	1.00	13.19
ATOM	2492	C	LEU	A	323	−12.778	19.449	−19.048	1.00	11.68
ATOM	2493	O	LEU	A	323	−13.444	18.510	−18.602	1.00	12.06
ATOM	2494	N	ALA	A	324	−12.036	20.239	−18.268	1.00	9.86
ATOM	2495	CA	ALA	A	324	−11.969	20.017	−16.812	1.00	10.09
ATOM	2496	CB	ALA	A	324	−10.746	20.767	−16.234	1.00	9.76
ATOM	2497	C	ALA	A	324	−13.272	20.518	−16.178	1.00	10.17
ATOM	2498	O	ALA	A	324	−13.866	19.840	−15.325	1.00	10.29
ATOM	2499	N	THR	A	325	−13.758	21.662	−16.665	1.00	9.84
ATOM	2500	CA	THR	A	325	−15.000	22.267	−16.172	1.00	11.14
ATOM	2501	CB	THR	A	325	−15.102	23.765	−16.623	1.00	12.15
ATOM	2502	OG1	THR	A	325	−14.002	24.498	−16.063	1.00	13.16
ATOM	2503	CG2	THR	A	325	−16.402	24.411	−16.152	1.00	11.83
ATOM	2504	C	THR	A	325	−16.218	21.413	−16.570	1.00	11.50
ATOM	2505	O	THR	A	325	−17.086	21.126	−15.727	1.00	10.79
ATOM	2506	N	PHE	A	326	−16.234	20.925	−17.816	1.00	10.79
ATOM	2507	CA	PHE	A	326	−17.272	19.959	−18.240	1.00	12.12
ATOM	2508	CB	PHE	A	326	−17.194	19.652	−19.746	1.00	12.14
ATOM	2509	CG	PHE	A	326	−17.518	20.851	−20.640	1.00	13.71
ATOM	2510	CD1	PHE	A	326	−16.777	21.077	−21.804	1.00	15.21
ATOM	2511	CE1	PHE	A	326	−17.043	22.188	−22.635	1.00	14.99
ATOM	2512	CZ	PHE	A	326	−18.072	23.066	−22.311	1.00	16.33
ATOM	2513	CE2	PHE	A	326	−18.851	22.832	−21.160	1.00	20.12
ATOM	2514	CD2	PHE	A	326	−18.561	21.717	−20.331	1.00	16.63
ATOM	2515	C	PHE	A	326	−17.216	18.643	−17.464	1.00	11.56
ATOM	2516	O	PHE	A	326	−18.263	18.069	−17.180	1.00	11.74
ATOM	2517	N	ALA	A	327	−16.014	18.174	−17.103	1.00	11.35
ATOM	2518	CA	ALA	A	327	−15.889	16.909	−16.346	1.00	11.41
ATOM	2519	CB	ALA	A	327	−14.397	16.538	−16.158	1.00	11.95
ATOM	2520	C	ALA	A	327	−16.612	16.964	−14.965	1.00	12.04
ATOM	2521	O	ALA	A	327	−17.260	15.985	−14.561	1.00	12.69
ATOM	2522	N	ALA	A	328	−16.505	18.097	−14.266	1.00	12.13
ATOM	2523	CA	ALA	A	328	−17.207	18.293	−12.985	1.00	12.24
ATOM	2524	CB	ALA	A	328	−16.871	19.662	−12.369	1.00	12.48
ATOM	2525	C	ALA	A	328	−18.707	18.157	−13.177	1.00	12.90
ATOM	2526	O	ALA	A	328	−19.378	17.454	−12.411	1.00	13.60
ATOM	2527	N	ALA	A	329	−19.239	18.814	−14.202	1.00	12.55
ATOM	2528	CA	ALA	A	329	−20.669	18.682	−14.504	1.00	12.31
ATOM	2529	CB	ALA	A	329	−21.027	19.551	−15.692	1.00	12.87
ATOM	2530	C	ALA	A	329	−21.035	17.226	−14.788	1.00	12.71
ATOM	2531	O	ALA	A	329	−22.016	16.700	−14.266	1.00	12.32
ATOM	2532	N	GLU	A	330	−20.231	16.572	−15.629	1.00	12.54
ATOM	2533	CA	GLU	A	330	−20.500	15.187	−16.003	1.00	12.84
ATOM	2534	CB	GLU	A	330	−19.519	14.718	−17.100	1.00	12.55
ATOM	2535	CG	GLU	A	330	−19.850	13.303	−17.626	1.00	13.80
ATOM	2536	CD	GLU	A	330	−19.108	12.953	−18.917	1.00	13.54
ATOM	2537	OE1	GLU	A	330	−18.650	13.889	−19.604	1.00	12.29
ATOM	2538	OE2	GLU	A	330	−18.998	11.739	−19.209	1.00	14.52
ATOM	2539	C	GLU	A	330	−20.523	14.231	−14.809	1.00	12.94
ATOM	2540	O	GLU	A	330	−21.400	13.346	−14.726	1.00	12.90
ATOM	2541	N	GLN	A	331	−19.598	14.402	−13.866	1.00	12.03
ATOM	2542	CA	GLN	A	331	−19.589	13.502	−12.726	1.00	12.38
ATOM	2543	CB	GLN	A	331	−18.415	13.795	−11.797	1.00	12.24
ATOM	2544	CG	GLN	A	331	−18.357	12.759	−10.670	1.00	13.61
ATOM	2545	CD	GLN	A	331	−17.327	13.072	−9.608	1.00	15.82
ATOM	2546	OE1	GLN	A	331	−16.263	13.617	−9.895	1.00	15.39
ATOM	2547	NE2	GLN	A	331	−17.628	12.702	−8.372	1.00	13.76
ATOM	2548	C	GLN	A	331	−20.912	13.643	−11.969	1.00	12.33
ATOM	2549	O	GLN	A	331	−21.512	12.659	−11.556	1.00	12.45
ATOM	2550	N	LEU	A	332	−21.377	14.873	−11.844	1.00	12.57
ATOM	2551	CA	LEU	A	332	−22.628	15.138	−11.134	1.00	13.59
ATOM	2552	CB	LEU	A	332	−22.747	16.631	−10.868	1.00	13.17
ATOM	2553	CG	LEU	A	332	−21.681	17.142	−9.867	1.00	16.56
ATOM	2554	CD1	LEU	A	332	−21.718	18.678	−9.801	1.00	18.10
ATOM	2555	CD2	LEU	A	332	−21.851	16.476	−8.492	1.00	19.47
ATOM	2556	C	LEU	A	332	−23.861	14.600	−11.864	1.00	13.57
ATOM	2557	O	LEU	A	332	−24.770	14.053	−11.239	1.00	13.24
ATOM	2558	N	TYR	A	333	−23.909	14.766	−13.179	1.00	13.90

TABLE 15-continued

ATOM	2559	CA	TYR	A	333	−24.988	14.131	−13.972	1.00	14.37
ATOM	2560	CB	TYR	A	333	−24.901	14.523	−15.468	1.00	14.48
ATOM	2561	CG	TYR	A	333	−25.056	16.001	−15.721	1.00	13.91
ATOM	2562	CD1	TYR	A	333	−26.086	16.738	−15.118	1.00	14.64
ATOM	2563	CE1	TYR	A	333	−26.208	18.117	−15.350	1.00	15.65
ATOM	2564	CZ	TYR	A	333	−25.315	18.758	−16.196	1.00	16.47
ATOM	2565	OH	TYR	A	333	−25.431	20.101	−16.442	1.00	17.22
ATOM	2566	CE2	TYR	A	333	−24.310	18.050	−16.836	1.00	16.59
ATOM	2567	CD2	TYR	A	333	−24.192	16.669	−16.601	1.00	11.27
ATOM	2568	C	TYR	A	333	−25.022	12.613	−13.843	1.00	15.03
ATOM	2569	O	TYR	A	333	−26.108	12.012	−13.824	1.00	14.78
ATOM	2570	N	ASP	A	334	−23.836	11.998	−13.807	1.00	14.06
ATOM	2571	CA	ASP	A	334	−23.714	10.555	−13.602	1.00	14.83
ATOM	2572	CB	ASP	A	334	−22.239	10.114	−13.714	1.00	13.83
ATOM	2573	CG	ASP	A	334	−21.708	10.149	−15.136	1.00	15.84
ATOM	2574	OD1	ASP	A	334	−22.495	10.373	−16.081	1.00	13.95
ATOM	2575	OD2	ASP	A	334	−20.470	9.943	−15.313	1.00	15.50
ATOM	2576	C	ASP	A	334	−24.254	10.163	−12.224	1.00	15.21
ATOM	2577	O	ASP	A	334	−24.941	9.132	−12.080	1.00	15.93
ATOM	2578	N	ALA	A	335	−23.933	10.969	−11.213	1.00	15.09
ATOM	2579	CA	ALA	A	335	−24.454	10.735	−9.855	1.00	16.00
ATOM	2580	CB	ALA	A	335	−23.809	11.719	−8.864	1.00	15.13
ATOM	2581	C	ALA	A	335	−25.980	10.823	−9.803	1.00	16.10
ATOM	2582	O	ALA	A	335	−26.643	9.916	−9.245	1.00	16.77
ATOM	2583	N	ILE	A	336	−26.530	11.879	−10.398	1.00	16.35
ATOM	2584	CA	ILE	A	336	−27.987	12.087	−10.470	1.00	18.39
ATOM	2585	CB	ILE	A	336	−28.332	13.422	−11.162	1.00	18.85
ATOM	2586	CG1	ILE	A	336	−27.891	14.596	−10.279	1.00	19.14
ATOM	2587	CD1	ILE	A	336	−27.879	15.904	−10.986	1.00	22.50
ATOM	2588	CG2	ILE	A	336	−29.839	13.539	−11.506	1.00	20.14
ATOM	2589	C	ILE	A	336	−28.681	10.902	−11.156	1.00	18.83
ATOM	2590	O	ILE	A	336	−29.707	10.404	−10.675	1.00	18.06
ATOM	2591	N	TYR	A	337	−28.102	10.443	−12.267	1.00	18.50
ATOM	2592	CA	TYR	A	337	−28.642	9.287	−12.970	1.00	18.99
ATOM	2593	CB	TYR	A	337	−27.753	8.908	−14.169	1.00	19.80
ATOM	2594	CG	TYR	A	337	−28.328	7.737	−14.954	1.00	20.76
ATOM	2595	CD1	TYR	A	337	−27.988	6.429	−14.620	1.00	20.95
ATOM	2596	CE1	TYR	A	337	−28.511	5.345	−15.322	1.00	22.94
ATOM	2597	CZ	TYR	A	337	−29.382	5.559	−16.356	1.00	22.19
ATOM	2598	OH	TYR	A	337	−29.877	4.447	−17.018	1.00	24.87
ATOM	2599	CE2	TYR	A	337	−29.752	6.845	−16.721	1.00	22.31
ATOM	2600	CD2	TYR	A	337	−29.220	7.942	−16.009	1.00	21.58
ATOM	2601	C	TYR	A	337	−28.839	8.083	−12.057	1.00	18.60
ATOM	2602	O	TYR	A	337	−29.918	7.476	−12.041	1.00	18.61
ATOM	2603	N	VAL	A	338	−27.802	7.737	−11.297	1.00	18.67
ATOM	2604	CA	VAL	A	338	−27.837	6.573	−10.406	1.00	18.90
ATOM	2605	CB	VAL	A	338	−26.424	6.195	−9.919	1.00	18.99
ATOM	2606	CG1	VAL	A	338	−26.462	5.121	−8.820	1.00	19.71
ATOM	2607	CG2	VAL	A	338	−25.600	5.698	−11.111	1.00	18.75
ATOM	2608	C	VAL	A	338	−28.810	6.788	−9.234	1.00	19.41
ATOM	2609	O	VAL	A	338	−29.565	5.871	−8.869	1.00	19.45
ATOM	2610	N	TRP	A	339	−28.797	7.987	−8.654	1.00	19.81
ATOM	2611	CA	TRP	A	339	−29.743	8.290	−7.559	1.00	20.46
ATOM	2612	CB	TRP	A	339	−29.514	9.705	−7.029	1.00	20.35
ATOM	2613	CG	TRP	A	339	−28.222	9.830	−6.329	1.00	18.64
ATOM	2614	CD1	TRP	A	339	−27.540	8.846	−5.676	1.00	16.51
ATOM	2615	NE1	TRP	A	339	−26.391	9.359	−5.126	1.00	17.81
ATOM	2616	CE2	TRP	A	339	−26.312	10.693	−5.423	1.00	17.12
ATOM	2617	CD2	TRP	A	339	−27.452	11.025	−6.183	1.00	17.64
ATOM	2618	CE3	TRP	A	339	−27.624	12.343	−6.614	1.00	17.59
ATOM	2619	CZ3	TRP	A	339	−26.637	13.283	−6.284	1.00	19.24
ATOM	2620	CH2	TRP	A	339	−25.510	12.912	−5.520	1.00	18.24
ATOM	2621	CZ2	TRP	A	339	−25.320	11.626	−5.103	1.00	18.45
ATOM	2622	C	TRP	A	339	−31.201	8.108	−7.997	1.00	21.83
ATOM	2623	O	TRP	A	339	−31.981	7.478	−7.274	1.00	22.01
ATOM	2624	N	LYS	A	340	−31.549	8.646	−9.168	1.00	22.85
ATOM	2625	CA	LYS	A	340	−32.904	8.541	−9.721	1.00	25.61
ATOM	2626	CB	LYS	A	340	−33.066	9.411	−10.967	1.00	25.52
ATOM	2627	CG	LYS	A	340	−33.174	10.905	−10.689	1.00	28.19
ATOM	2628	CD	LYS	A	340	−33.227	11.692	−11.991	1.00	34.04
ATOM	2629	CE	LYS	A	340	−33.966	13.011	−11.805	1.00	38.04
ATOM	2630	NZ	LYS	A	340	−33.868	13.876	−13.017	1.00	41.83
ATOM	2631	C	LYS	A	340	−33.276	7.108	−10.062	1.00	27.14
ATOM	2632	O	LYS	A	340	−34.413	6.686	−9.830	1.00	27.56
ATOM	2633	N	LYS	A	341	−32.317	6.358	−10.604	1.00	28.13
ATOM	2634	CA	LYS	A	341	−32.552	4.975	−11.018	1.00	30.18
ATOM	2635	CB	LYS	A	341	−31.358	4.428	−11.800	1.00	29.83
ATOM	2636	CG	LYS	A	341	−31.688	3.173	−12.624	1.00	33.04
ATOM	2637	CD	LYS	A	341	−30.472	2.624	−13.395	1.00	33.62
ATOM	2638	CE	LYS	A	341	−29.652	1.592	−12.588	1.00	38.22

TABLE 15-continued

ATOM	2639	NZ	LYS	A	341	−28.691	2.188	−11.573	1.00	40.88
ATOM	2640	C	LYS	A	341	−32.816	4.081	−9.817	1.00	30.19
ATOM	2641	O	LYS	A	341	−33.744	3.260	−9.837	1.00	30.15
ATOM	2642	N	THR	A	342	−31.999	4.246	−8.777	1.00	29.52
ATOM	2643	CA	THR	A	342	−32.074	3.400	−7.595	1.00	29.75
ATOM	2644	CB	THR	A	342	−30.687	3.221	−6.916	1.00	29.68
ATOM	2645	OG1	THR	A	342	−30.254	4.458	−6.333	1.00	32.01
ATOM	2646	CG2	THR	A	342	−29.628	2.735	−7.929	1.00	31.40
ATOM	2647	C	THR	A	342	−33.129	3.901	−6.596	1.00	29.01
ATOM	2648	O	THR	A	342	−33.572	3.148	−5.734	1.00	29.92
ATOM	2649	N	GLY	A	343	−33.534	5.158	−6.732	1.00	28.20
ATOM	2650	CA	GLY	A	343	−34.537	5.782	−5.862	1.00	28.30
ATOM	2651	C	GLY	A	343	−34.068	6.045	−4.438	1.00	27.91
ATOM	2652	O	GLY	A	343	−34.887	6.133	−3.519	1.00	28.16
ATOM	2653	N	SER	A	344	−32.760	6.226	−4.260	1.00	27.22
ATOM	2654	CA	SER	A	344	−32.142	6.306	−2.939	1.00	26.60
ATOM	2655	CB	SER	A	344	−31.870	4.880	−2.462	1.00	27.28
ATOM	2656	OG	SER	A	344	−31.354	4.855	−1.161	1.00	29.50
ATOM	2657	C	SER	A	344	−30.823	7.107	−2.979	1.00	26.02
ATOM	2658	O	SER	A	344	−30.068	6.992	−3.944	1.00	25.80
ATOM	2659	N	ILE	A	345	−30.557	7.900	−1.936	1.00	24.20
ATOM	2660	CA	ILE	A	345	−29.295	8.641	−1.770	1.00	23.04
ATOM	2661	CB	ILE	A	345	−29.477	10.171	−1.954	1.00	23.03
ATOM	2662	CG1	ILE	A	345	−30.021	10.474	−3.340	1.00	22.44
ATOM	2663	CD1	ILE	A	345	−30.399	11.918	−3.599	1.00	23.24
ATOM	2664	CG2	ILE	A	345	−28.138	10.918	−1.670	1.00	22.00
ATOM	2665	C	ILE	A	345	−28.726	8.415	−0.378	1.00	23.13
ATOM	2666	O	ILE	A	345	−29.392	8.684	0.623	1.00	23.57
ATOM	2667	N	THR	A	346	−27.490	7.943	−0.307	1.00	22.23
ATOM	2668	CA	THR	A	346	−26.820	7.765	0.963	1.00	23.25
ATOM	2669	CB	THR	A	346	−26.246	6.338	1.101	1.00	23.78
ATOM	2670	OG1	THR	A	346	−27.327	5.396	1.020	1.00	27.42
ATOM	2671	CG2	THR	A	346	−25.507	6.129	2.443	1.00	24.74
ATOM	2672	C	THR	A	346	−25.753	8.849	1.138	1.00	23.03
ATOM	2673	O	THR	A	346	−24.916	9.067	0.260	1.00	23.47
ATOM	2674	N	VAL	A	347	−25.848	9.561	2.255	1.00	21.33
ATOM	2675	CA	VAL	A	347	−24.845	10.537	2.674	1.00	20.11
ATOM	2676	CB	VAL	A	347	−25.522	11.844	3.212	1.00	19.06
ATOM	2677	CG1	VAL	A	347	−24.489	12.834	3.700	1.00	19.66
ATOM	2678	CG2	VAL	A	347	−26.418	12.465	2.137	1.00	20.32
ATOM	2679	C	VAL	A	347	−24.066	9.865	3.785	1.00	20.14
ATOM	2680	O	VAL	A	347	−24.667	9.340	4.728	1.00	19.79
ATOM	2681	N	THR	A	348	−22.734	9.878	3.671	1.00	19.85
ATOM	2682	CA	THR	A	348	−21.851	9.274	4.660	1.00	19.92
ATOM	2683	CB	THR	A	348	−20.965	8.185	4.018	1.00	19.82
ATOM	2684	OG1	THR	A	348	−19.921	8.815	3.277	1.00	20.35
ATOM	2685	CG2	THR	A	348	−21.785	7.278	3.092	1.00	21.67
ATOM	2686	C	THR	A	348	−20.964	10.354	5.256	1.00	19.60
ATOM	2687	O	THR	A	348	−20.961	11.484	4.760	1.00	19.51
ATOM	2688	N	ALA	A	349	−20.191	10.006	6.292	1.00	19.18
ATOM	2689	CA	ALA	A	349	−19.243	10.932	6.885	1.00	20.02
ATOM	2690	CB	ALA	A	349	−18.494	10.275	8.044	1.00	20.61
ATOM	2691	C	ALA	A	349	−18.240	11.466	5.842	1.00	19.79
ATOM	2692	O	ALA	A	349	−17.756	12.601	5.947	1.00	20.15
ATOM	2693	N	THR	A	350	−17.906	10.619	4.873	1.00	18.87
ATOM	2694	CA	THR	A	350	−16.911	10.971	3.850	1.00	18.30
ATOM	2695	CB	THR	A	350	−16.435	9.717	3.093	1.00	18.67
ATOM	2696	OG1	THR	A	350	−15.780	8.850	4.027	1.00	19.82
ATOM	2697	CG2	THR	A	350	−15.426	10.097	1.974	1.00	17.73
ATOM	2698	C	THR	A	350	−17.463	12.003	2.871	1.00	17.30
ATOM	2699	O	THR	A	350	−16.747	12.930	2.487	1.00	17.99
ATOM	2700	N	SER	A	351	−18.716	11.847	2.467	1.00	16.16
ATOM	2701	CA	SER	A	351	−19.316	12.803	1.517	1.00	15.78
ATOM	2702	CB	SER	A	351	−20.214	12.076	0.512	1.00	15.85
ATOM	2703	OG	SER	A	351	−21.280	11.412	1.156	1.00	17.14
ATOM	2704	C	SER	A	351	−20.087	13.941	2.193	1.00	15.63
ATOM	2705	O	SER	A	351	−20.736	14.743	1.524	1.00	13.62
ATOM	2706	N	LEU	A	352	−20.048	14.006	3.527	1.00	15.09
ATOM	2707	CA	LEU	A	352	−20.901	14.985	4.212	1.00	16.29
ATOM	2708	CB	LEU	A	352	−20.759	14.851	5.736	1.00	16.64
ATOM	2709	CG	LEU	A	352	−21.713	15.734	6.570	1.00	17.22
ATOM	2710	CD1	LEU	A	352	−23.138	15.281	6.418	1.00	19.06
ATOM	2711	CD2	LEU	A	352	−21.263	15.636	8.032	1.00	20.02
ATOM	2712	C	LEU	A	352	−20.592	16.427	3.787	1.00	16.09
ATOM	2713	O	LEU	A	352	−21.499	17.219	3.601	1.00	16.35
ATOM	2714	N	ALA	A	353	−19.311	16.763	3.643	1.00	16.19
ATOM	2715	CA	ALA	A	353	−18.933	18.148	3.354	1.00	15.74
ATOM	2716	CB	ALA	A	353	−17.460	18.314	3.424	1.00	16.30
ATOM	2717	C	ALA	A	353	−19.459	18.544	1.972	1.00	16.11
ATOM	2718	O	ALA	A	353	−19.957	19.668	1.781	1.00	15.44

TABLE 15-continued

ATOM	2719	N	PHE	A	354	−19.367	17.607	1.021	1.00	16.10
ATOM	2720	CA	PHE	A	354	−19.885	17.849	−0.325	1.00	15.25
ATOM	2721	CB	PHE	A	354	−19.718	16.618	−1.220	1.00	16.59
ATOM	2722	CG	PHE	A	354	−20.497	16.707	−2.500	1.00	15.45
ATOM	2723	CD1	PHE	A	354	−19.959	17.375	−3.603	1.00	16.95
ATOM	2724	CE1	PHE	A	354	−20.664	17.489	−4.793	1.00	17.06
ATOM	2725	CZ	PHE	A	354	−21.956	16.953	−4.888	1.00	16.75
ATOM	2726	CE2	PHE	A	354	−22.517	16.276	−3.791	1.00	16.91
ATOM	2727	CD2	PHE	A	354	−21.778	16.160	−2.594	1.00	17.48
ATOM	2728	C	PHE	A	354	−21.374	18.188	−0.226	1.00	15.56
ATOM	2729	O	PHE	A	354	−21.815	19.183	−0.797	1.00	15.08
ATOM	2730	N	PHE	A	355	−22.140	17.347	0.474	1.00	14.54
ATOM	2731	CA	PHE	A	355	−23.588	17.544	0.517	1.00	15.29
ATOM	2732	CB	PHE	A	355	−24.295	16.319	1.078	1.00	15.61
ATOM	2733	CG	PHE	A	355	−24.386	15.176	0.112	1.00	15.51
ATOM	2734	CD1	PHE	A	355	−25.306	15.205	−0.945	1.00	14.91
ATOM	2735	CE1	PHE	A	355	−25.404	14.131	−1.832	1.00	16.52
ATOM	2736	CZ	PHE	A	355	−24.567	13.033	−1.676	1.00	16.12
ATOM	2737	CE2	PHE	A	355	−23.648	12.994	−0.628	1.00	15.62
ATOM	2738	CD2	PHE	A	355	−23.562	14.071	0.255	1.00	13.62
ATOM	2739	C	PHE	A	355	−23.988	18.789	1.303	1.00	15.19
ATOM	2740	O	PHE	A	355	−24.920	19.477	0.902	1.00	15.69
ATOM	2741	N	GLN	A	356	−23.283	19.084	2.398	1.00	15.78
ATOM	2742	CA	GLN	A	356	−23.679	20.216	3.257	1.00	16.16
ATOM	2743	CB	GLN	A	356	−22.987	20.165	4.627	1.00	16.84
ATOM	2744	CG	GLN	A	356	−23.564	19.115	5.579	1.00	17.13
ATOM	2745	CD	GLN	A	356	−22.907	19.170	6.973	1.00	18.06
ATOM	2746	OE1	GLN	A	356	−21.808	19.707	7.138	1.00	20.29
ATOM	2747	NE2	GLN	A	356	−23.569	18.589	7.965	1.00	20.95
ATOM	2748	C	GLN	A	356	−23.444	21.546	2.584	1.00	16.08
ATOM	2749	O	GLN	A	356	−24.142	22.507	2.868	1.00	15.59
ATOM	2750	N	GLU	A	357	−22.482	21.599	1.661	1.00	16.07
ATOM	2751	CA	GLU	A	357	−22.261	22.808	0.884	1.00	16.41
ATOM	2752	CB	GLU	A	357	−20.994	22.683	0.005	1.00	16.33
ATOM	2753	CG	GLU	A	357	−20.671	23.942	−0.770	1.00	15.64
ATOM	2754	CD	GLU	A	357	−19.326	23.894	−1.516	1.00	17.67
ATOM	2755	OE1	GLU	A	357	−18.931	24.947	−2.066	1.00	19.03
ATOM	2756	OE2	GLU	A	357	−18.685	22.822	−1.575	1.00	14.75
ATOM	2757	C	GLU	A	357	−23.492	23.105	0.019	1.00	15.84
ATOM	2758	O	GLU	A	357	−23.786	24.237	−0.224	1.00	18.07
ATOM	2759	N	LEU	A	358	−24.213	22.084	−0.420	1.00	14.72
ATOM	2760	CA	LEU	A	358	−25.364	22.251	−1.310	1.00	15.75
ATOM	2761	CB	LEU	A	358	−25.368	21.147	−2.369	1.00	16.49
ATOM	2762	CG	LEU	A	358	−24.057	21.100	−3.168	1.00	16.81
ATOM	2763	CD1	LEU	A	358	−24.087	19.977	−4.182	1.00	19.73
ATOM	2764	CD2	LEU	A	358	−23.775	22.465	−3.846	1.00	19.34
ATOM	2765	C	LEU	A	358	−26.708	22.251	−0.582	1.00	15.36
ATOM	2766	O	LEU	A	358	−27.656	22.911	−1.028	1.00	14.78
ATOM	2767	N	VAL	A	359	−26.786	21.511	0.520	1.00	15.34
ATOM	2768	CA	VAL	A	359	−28.001	21.404	1.321	1.00	15.00
ATOM	2769	CB	VAL	A	359	−28.691	20.006	1.154	1.00	15.90
ATOM	2770	CG1	VAL	A	359	−29.999	19.917	1.962	1.00	15.16
ATOM	2771	CG2	VAL	A	359	−28.967	19.685	−0.348	1.00	16.26
ATOM	2772	C	VAL	A	359	−27.531	21.624	2.775	1.00	14.72
ATOM	2773	O	VAL	A	359	−27.192	20.653	3.500	1.00	14.22
ATOM	2774	N	PRO	A	360	−27.467	22.893	3.193	1.00	14.98
ATOM	2775	CA	PRO	A	360	−26.937	23.179	4.539	1.00	15.45
ATOM	2776	CB	PRO	A	360	−27.150	24.700	4.700	1.00	15.45
ATOM	2777	CG	PRO	A	360	−27.188	25.219	3.274	1.00	16.15
ATOM	2778	CD	PRO	A	360	−27.854	24.127	2.471	1.00	14.54
ATOM	2779	C	PRO	A	360	−27.692	22.385	5.611	1.00	15.31
ATOM	2780	O	PRO	A	360	−28.918	22.262	5.555	1.00	15.07
ATOM	2781	N	GLY	A	361	−26.936	21.842	6.560	1.00	15.94
ATOM	2782	CA	GLY	A	361	−27.512	21.143	7.709	1.00	16.53
ATOM	2783	C	GLY	A	361	−27.870	19.680	7.488	1.00	17.03
ATOM	2784	O	GLY	A	361	−28.268	18.997	8.429	1.00	17.68
ATOM	2785	N	VAL	A	362	−27.762	19.176	6.261	1.00	16.13
ATOM	2786	CA	VAL	A	362	−28.163	17.769	6.037	1.00	16.72
ATOM	2787	CB	VAL	A	362	−28.217	17.416	4.525	1.00	16.47
ATOM	2788	CG1	VAL	A	362	−26.808	17.311	3.947	1.00	16.75
ATOM	2789	CG2	VAL	A	362	−29.054	16.142	4.280	1.00	17.21
ATOM	2790	C	VAL	A	362	−27.208	16.849	6.811	1.00	17.24
ATOM	2791	O	VAL	A	362	−26.044	17.187	7.006	1.00	17.07
ATOM	2792	N	THR	A	363	−27.695	15.703	7.274	1.00	18.15
ATOM	2793	CA	THR	A	363	−26.821	14.789	8.025	1.00	19.86
ATOM	2794	CB	THR	A	363	−27.388	14.459	9.405	1.00	20.59
ATOM	2795	OG1	THR	A	363	−28.634	13.776	9.217	1.00	22.85
ATOM	2796	CG2	THR	A	363	−27.610	15.742	10.182	1.00	22.71
ATOM	2797	C	THR	A	363	−26.660	13.476	7.310	1.00	19.18
ATOM	2798	O	THR	A	363	−27.398	13.184	6.371	1.00	18.87

TABLE 15-continued

ATOM	2799	N	ALA	A	364	−25.697	12.679	7.769	1.00	19.67
ATOM	2800	CA	ALA	A	364	−25.495	11.342	7.222	1.00	20.19
ATOM	2801	CB	ALA	A	364	−24.361	10.637	7.930	1.00	20.38
ATOM	2802	C	ALA	A	364	−26.783	10.541	7.343	1.00	21.17
ATOM	2803	O	ALA	A	364	−27.551	10.720	8.293	1.00	21.92
ATOM	2804	N	GLY	A	365	−27.041	9.687	6.360	1.00	21.67
ATOM	2805	CA	GLY	A	365	−28.207	8.823	6.371	1.00	22.35
ATOM	2806	C	GLY	A	365	−28.584	8.415	4.968	1.00	23.66
ATOM	2807	O	GLY	A	365	−27.924	8.804	3.991	1.00	23.66
ATOM	2808	N	THR	A	366	−29.639	7.615	4.862	1.00	23.70
ATOM	2809	CA	THR	A	366	−30.148	7.183	3.582	1.00	24.56
ATOM	2810	CB	THR	A	366	−30.188	5.644	3.491	1.00	25.67
ATOM	2811	OG1	THR	A	366	−28.849	5.143	3.649	1.00	27.09
ATOM	2812	CG2	THR	A	366	−30.715	5.216	2.159	1.00	25.47
ATOM	2813	C	THR	A	366	−31.520	7.769	3.344	1.00	25.15
ATOM	2814	O	THR	A	366	−32.427	7.612	4.177	1.00	25.01
ATOM	2815	N	TYR	A	367	−31.668	8.447	2.210	1.00	24.20
ATOM	2816	CA	TYR	A	367	−32.900	9.146	1.883	1.00	24.30
ATOM	2817	CB	TYR	A	367	−32.616	10.648	1.701	1.00	23.51
ATOM	2818	CG	TYR	A	367	−31.924	11.238	2.907	1.00	22.68
ATOM	2819	CD1	TYR	A	367	−32.639	11.506	4.078	1.00	21.99
ATOM	2820	CE1	TYR	A	367	−32.012	12.019	5.199	1.00	20.27
ATOM	2821	CZ	TYR	A	367	−30.650	12.263	5.176	1.00	22.67
ATOM	2822	OH	TYR	A	367	−30.036	12.789	6.287	1.00	21.24
ATOM	2823	CE2	TYR	A	367	−29.897	11.994	4.023	1.00	20.71
ATOM	2824	CD2	TYR	A	367	−30.541	11.479	2.904	1.00	20.37
ATOM	2825	C	TYR	A	367	−33.531	8.542	0.641	1.00	25.39
ATOM	2826	O	TYR	A	367	−32.900	8.456	−0.415	1.00	24.86
ATOM	2827	N	SER	A	368	−34.782	8.109	0.758	1.00	25.82
ATOM	2828	CA	SER	A	368	−35.416	7.454	−0.374	1.00	27.29
ATOM	2829	CB	SER	A	368	−36.339	6.332	0.107	1.00	27.90
ATOM	2830	OG	SER	A	368	−37.519	6.895	0.634	1.00	30.69
ATOM	2831	C	SER	A	368	−36.171	8.466	−1.218	1.00	27.68
ATOM	2832	O	SER	A	368	−36.361	9.612	−0.805	1.00	26.96
ATOM	2833	N	SER	A	369	−36.629	8.025	−2.388	1.00	28.98
ATOM	2834	CA	SER	A	369	−37.260	8.908	−3.367	1.00	30.52
ATOM	2835	CB	SER	A	369	−37.520	8.167	−4.681	1.00	30.90
ATOM	2836	OG	SER	A	369	−38.269	6.983	−4.452	1.00	32.57
ATOM	2837	C	SER	A	369	−38.536	9.583	−2.871	1.00	31.50
ATOM	2838	O	SER	A	369	−38.954	10.572	−3.442	1.00	32.33
ATOM	2839	N	SER	A	370	−39.150	9.067	−1.809	1.00	32.18
ATOM	2840	CA	SER	A	370	−40.365	9.712	−1.279	1.00	32.96
ATOM	2841	CB	SER	A	370	−41.313	8.692	−0.624	1.00	33.18
ATOM	2842	OG	SER	A	370	−40.610	7.847	0.273	1.00	34.18
ATOM	2843	C	SER	A	370	−40.049	10.864	−0.323	1.00	32.37
ATOM	2844	O	SER	A	370	−40.901	11.729	−0.078	1.00	33.26
ATOM	2845	N	SER	A	371	−38.825	10.893	0.197	1.00	31.13
ATOM	2846	CA	SER	A	371	−38.443	11.911	1.174	1.00	30.04
ATOM	2847	CB	SER	A	371	−37.180	11.487	1.912	1.00	29.83
ATOM	2848	OG	SER	A	371	−36.046	11.714	1.100	1.00	30.43
ATOM	2849	C	SER	A	371	−38.247	13.295	0.553	1.00	29.13
ATOM	2850	O	SER	A	371	−37.795	13.424	−0.589	1.00	28.84
ATOM	2851	N	SER	A	372	−38.571	14.340	1.312	1.00	27.84
ATOM	2852	CA	SER	A	372	−38.300	15.689	0.845	1.00	27.18
ATOM	2853	CB	SER	A	372	−38.896	16.737	1.789	1.00	27.36
ATOM	2854	OG	SER	A	372	−38.331	16.609	3.080	1.00	28.50
ATOM	2855	C	SER	A	372	−36.783	15.902	0.680	1.00	25.79
ATOM	2856	O	SER	A	372	−36.358	16.690	−0.173	1.00	26.29
ATOM	2857	N	THR	A	373	−35.979	15.193	1.479	1.00	24.06
ATOM	2858	CA	THR	A	373	−34.517	15.337	1.448	1.00	22.51
ATOM	2859	CB	THR	A	373	−33.833	14.501	2.545	1.00	22.26
ATOM	2860	OG1	THR	A	373	−34.543	14.636	3.788	1.00	23.04
ATOM	2861	CG2	THR	A	373	−32.370	14.926	2.734	1.00	21.06
ATOM	2862	C	THR	A	373	−33.984	14.906	0.076	1.00	21.61
ATOM	2863	O	THR	A	373	−33.134	15.578	−0.513	1.00	19.74
ATOM	2864	N	PHE	A	374	−34.493	13.777	−0.413	1.00	21.13
ATOM	2865	CA	PHE	A	374	−34.137	13.280	−1.749	1.00	22.10
ATOM	2866	CB	PHE	A	374	−34.950	12.023	−2.051	1.00	22.12
ATOM	2867	CG	PHE	A	374	−34.624	11.380	−3.366	1.00	22.90
ATOM	2868	CD1	PHE	A	374	−33.677	10.368	−3.432	1.00	23.83
ATOM	2869	CE1	PHE	A	374	−33.381	9.749	−4.649	1.00	22.56
ATOM	2870	CZ	PHE	A	374	−34.041	10.162	−5.802	1.00	23.24
ATOM	2871	CE2	PHE	A	374	−34.985	11.161	−5.752	1.00	23.36
ATOM	2872	CD2	PHE	A	374	−35.280	11.769	−4.523	1.00	23.73
ATOM	2873	C	PHE	A	374	−34.343	14.349	−2.818	1.00	22.24
ATOM	2874	O	PHE	A	374	−33.413	14.681	−3.548	1.00	22.63
ATOM	2875	N	THR	A	375	−35.549	14.923	−2.880	1.00	22.72
ATOM	2876	CA	THR	A	375	−35.890	15.963	−3.852	1.00	23.34
ATOM	2877	CB	THR	A	375	−37.364	16.398	−3.683	1.00	23.63
ATOM	2878	OG1	THR	A	375	−38.193	15.244	−3.809	1.00	27.83

TABLE 15-continued

ATOM	2879	CG2	THR	A	375	−37.768	17.413	−4.749	1.00	27.05
ATOM	2880	C	THR	A	375	−35.003	17.203	−3.746	1.00	22.66
ATOM	2881	O	THR	A	375	−34.603	17.766	−4.756	1.00	21.43
ATOM	2882	N	ASN	A	376	−34.744	17.632	−2.508	1.00	20.80
ATOM	2883	CA	ASN	A	376	−33.880	18.766	−2.207	1.00	21.33
ATOM	2884	CB	ASN	A	376	−33.856	18.975	−0.688	1.00	21.98
ATOM	2885	CG	ASN	A	376	−33.343	20.354	−0.278	1.00	27.01
ATOM	2886	OD1	ASN	A	376	−32.582	21.011	−1.004	1.00	31.72
ATOM	2887	ND2	ASN	A	376	−33.748	20.793	0.913	1.00	30.14
ATOM	2888	C	ASN	A	376	−32.465	18.527	−2.733	1.00	19.80
ATOM	2889	O	ASN	A	376	−31.898	19.389	−3.415	1.00	19.75
ATOM	2890	N	ILE	A	377	−31.915	17.354	−2.431	1.00	19.00
ATOM	2891	CA	ILE	A	377	−30.586	16.983	−2.916	1.00	18.66
ATOM	2892	CB	ILE	A	377	−30.081	15.651	−2.319	1.00	18.56
ATOM	2893	CG1	ILE	A	377	−29.834	15.813	−0.800	1.00	18.42
ATOM	2894	CD1	ILE	A	377	−29.634	14.481	−0.028	1.00	19.35
ATOM	2895	CG2	ILE	A	377	−28.787	15.233	−3.025	1.00	18.07
ATOM	2896	C	ILE	A	377	−30.546	16.964	−4.451	1.00	18.87
ATOM	2897	O	ILE	A	377	−29.655	17.575	−5.058	1.00	18.47
ATOM	2898	N	ILE	A	378	−31.513	16.293	−5.068	1.00	18.45
ATOM	2899	CA	ILE	A	378	−31.556	16.216	−6.539	1.00	19.78
ATOM	2900	CB	ILE	A	378	−32.738	15.359	−7.085	1.00	20.45
ATOM	2901	CG1	ILE	A	378	−32.593	13.891	−6.650	1.00	22.32
ATOM	2902	CD1	ILE	A	378	−31.414	13.145	−7.270	1.00	24.68
ATOM	2903	CG2	ILE	A	378	−32.829	15.472	−8.646	1.00	21.27
ATOM	2904	C	ILE	A	378	−31.561	17.588	−1.111	1.00	19.82
ATOM	2905	O	ILE	A	378	−30.760	17.849	−8.101	1.00	19.62
ATOM	2906	N	ASN	A	379	−32.441	18.470	−6.689	1.00	18.68
ATOM	2907	CA	ASN	A	379	−32.531	19.820	−7.224	1.00	19.13
ATOM	2908	CB	ASN	A	379	−33.738	20.578	−6.658	1.00	20.08
ATOM	2909	CG	ASN	A	379	−35.066	19.956	−7.087	1.00	25.11
ATOM	2910	OD1	ASN	A	379	−35.121	19.173	−8.044	1.00	29.37
ATOM	2911	ND2	ASN	A	379	−36.144	20.289	−6.369	1.00	29.08
ATOM	2912	C	ASN	A	379	−31.241	20.604	−7.040	1.00	17.96
ATOM	2913	O	ASN	A	379	−30.774	21.273	−7.981	1.00	17.85
ATOM	2914	N	ALA	A	380	−30.662	20.497	−5.841	1.00	15.93
ATOM	2915	CA	ALA	A	380	−29.458	21.241	−5.509	1.00	16.08
ATOM	2916	CB	ALA	A	380	−29.120	21.061	−4.033	1.00	16.14
ATOM	2917	C	ALA	A	380	−28.299	20.783	−6.389	1.00	15.64
ATOM	2918	O	ALA	A	380	−27.566	21.607	−6.938	1.00	16.56
ATOM	2919	N	VAL	A	381	−28.153	19.471	−6.519	1.00	15.22
ATOM	2920	CA	VAL	A	381	−27.039	18.912	−7.302	1.00	15.77
ATOM	2921	CB	VAL	A	381	−26.823	17.403	−6.999	1.00	15.61
ATOM	2922	CG1	VAL	A	381	−25.747	16.777	−7.940	1.00	14.83
ATOM	2923	CG2	VAL	A	381	−26.386	17.234	−5.551	1.00	14.84
ATOM	2924	C	VAL	A	381	−27.243	19.211	−8.794	1.00	16.08
ATOM	2925	O	VAL	A	381	−26.281	19.508	−9.505	1.00	16.62
ATOM	2926	N	SER	A	382	−28.482	19.112	−9.278	1.00	16.66
ATOM	2927	CA	SER	A	382	−28.772	19.453	−10.690	1.00	18.67
ATOM	2928	CB	SER	A	382	−30.246	19.212	−11.043	1.00	18.26
ATOM	2929	OG	SER	A	382	−30.538	17.855	−10.893	1.00	24.56
ATOM	2930	C	SER	A	382	−28.434	20.894	−11.005	1.00	18.10
ATOM	2931	O	SER	A	382	−27.815	21.183	−12.027	1.00	18.05
ATOM	2932	N	THR	A	383	−28.853	21.810	−10.132	1.00	17.66
ATOM	2933	CA	THR	A	383	−28.521	23.216	−10.298	1.00	17.72
ATOM	2934	CB	THR	A	383	−29.199	24.063	−9.180	1.00	18.48
ATOM	2935	OG1	THR	A	383	−30.606	23.985	−9.373	1.00	19.72
ATOM	2936	CG2	THR	A	383	−28.771	25.550	−9.227	1.00	19.59
ATOM	2937	C	THR	A	383	−27.017	23.470	−10.314	1.00	17.09
ATOM	2938	O	THR	A	383	−26.524	24.286	−11.109	1.00	17.00
ATOM	2939	N	TYR	A	384	−26.299	22.774	−9.435	1.00	15.62
ATOM	2940	CA	TYR	A	384	−24.858	22.925	−9.312	1.00	15.37
ATOM	2941	CB	TYR	A	384	−24.397	22.164	−8.068	1.00	15.00
ATOM	2942	CG	TYR	A	384	−22.958	22.345	−7.630	1.00	15.08
ATOM	2943	CD1	TYR	A	384	−22.361	23.601	−7.578	1.00	15.83
ATOM	2944	CE1	TYR	A	384	−21.049	23.752	−7.131	1.00	16.33
ATOM	2945	CZ	TYR	A	384	−20.321	22.623	−6.737	1.00	16.13
ATOM	2946	OH	TYR	A	384	−19.018	22.738	−6.302	1.00	16.22
ATOM	2947	CE2	TYR	A	384	−20.890	21.386	−6.778	1.00	13.72
ATOM	2948	CD2	TYR	A	384	−22.203	21.242	−7.232	1.00	14.72
ATOM	2949	C	TYR	A	384	−24.186	22.396	−10.590	1.00	15.13
ATOM	2950	O	TYR	A	384	−23.319	23.065	−11.173	1.00	14.43
ATOM	2951	N	ALA	A	385	−24.605	21.213	−11.033	1.00	15.02
ATOM	2952	CA	ALA	A	385	−24.045	20.639	−12.263	1.00	15.60
ATOM	2953	CB	ALA	A	385	−24.634	19.295	−12.503	1.00	15.85
ATOM	2954	C	ALA	A	385	−24.249	21.564	−13.477	1.00	16.15
ATOM	2955	O	ALA	A	385	−23.292	21.857	−14.211	1.00	15.49
ATOM	2956	N	ASP	A	386	−25.483	22.055	−13.660	1.00	15.57
ATOM	2957	CA	ASP	A	386	−25.782	23.058	−14.694	1.00	16.09
ATOM	2958	CB	ASP	A	386	−27.279	23.433	−14.687	1.00	15.88

TABLE 15-continued

ATOM	2959	CG	ASP	A	386	−28.158	22.379	−15.349	1.00	18.85
ATOM	2960	OD1	ASP	A	386	−27.672	21.307	−15.766	1.00	18.94
ATOM	2961	OD2	ASP	A	386	−29.365	22.624	−15.461	1.00	23.88
ATOM	2962	C	ASP	A	386	−24.938	24.322	−14.526	1.00	15.81
ATOM	2963	O	ASP	A	386	−24.594	24.998	−15.501	1.00	16.29
ATOM	2964	N	GLY	A	387	−24.591	24.640	−13.290	1.00	15.76
ATOM	2965	CA	GLY	A	387	−23.735	25.787	−13.038	1.00	14.35
ATOM	2966	C	GLY	A	387	−22.354	25.654	−13.663	1.00	14.35
ATOM	2967	O	GLY	A	387	−21.791	26.644	−14.129	1.00	13.79
ATOM	2968	N	PHE	A	388	−21.771	24.453	−13.624	1.00	14.30
ATOM	2969	CA	PHE	A	388	−20.479	24.217	−14.312	1.00	14.69
ATOM	2970	CB	PHE	A	388	−19.912	22.824	−13.987	1.00	14.42
ATOM	2971	CG	PHE	A	388	−19.359	22.730	−12.584	1.00	13.79
ATOM	2972	CD1	PHE	A	388	−18.139	23.335	−12.269	1.00	14.50
ATOM	2973	CE1	PHE	A	388	−17.621	23.261	−10.947	1.00	16.38
ATOM	2974	CZ	PHE	A	388	−18.377	22.627	−9.951	1.00	14.77
ATOM	2975	CE2	PHE	A	388	−19.604	22.045	−10.265	1.00	16.35
ATOM	2976	CD2	PHE	A	388	−20.088	22.100	−11.578	1.00	14.00
ATOM	2977	C	PHE	A	388	−20.601	24.428	−15.821	1.00	15.31
ATOM	2978	O	PHE	A	388	−19.740	25.078	−16.440	1.00	15.55
ATOM	2979	N	LEU	A	389	−21.669	23.913	−16.415	1.00	16.52
ATOM	2980	CA	LEU	A	389	−21.889	24.159	−17.856	1.00	17.84
ATOM	2981	CB	LEU	A	389	−23.137	23.431	−18.382	1.00	17.83
ATOM	2982	CG	LEU	A	389	−23.172	21.911	−18.427	1.00	22.75
ATOM	2983	CD1	LEU	A	389	−24.247	21.418	−19.401	1.00	22.55
ATOM	2984	CD2	LEU	A	389	−21.805	21.333	−18.806	1.00	24.63
ATOM	2985	C	LEU	A	389	−22.013	25.634	−18.136	1.00	18.32
ATOM	2986	O	LEU	A	389	−21.409	26.138	−19.091	1.00	19.50
ATOM	2987	N	SER	A	390	−22.775	26.341	−17.295	1.00	18.55
ATOM	2988	CA	SER	A	390	−23.021	27.767	−17.469	1.00	19.33
ATOM	2989	CB	SER	A	390	−24.090	28.246	−16.491	1.00	19.89
ATOM	2990	OG	SER	A	390	−25.325	27.693	−16.891	1.00	24.07
ATOM	2991	C	SER	A	390	−21.763	28.603	−17.323	1.00	19.51
ATOM	2992	O	SER	A	390	−21.575	29.585	−18.055	1.00	19.69
ATOM	2993	N	GLU	A	391	−20.893	28.200	−16.399	1.00	18.87
ATOM	2994	CA	GLU	A	391	−19.633	28.879	−16.220	1.00	19.59
ATOM	2995	CB	GLU	A	391	−18.901	28.393	−14.952	1.00	20.02
ATOM	2996	CG	GLU	A	391	−19.528	28.924	−13.668	1.00	23.54
ATOM	2997	CD	GLU	A	391	−19.590	30.448	−13.634	1.00	26.61
ATOM	2998	OE1	GLU	A	391	−18.609	31.102	−14.023	1.00	28.42
ATOM	2999	OE2	GLU	A	391	−20.637	30.994	−13.227	1.00	29.52
ATOM	3000	C	GLU	A	391	−18.738	28.729	−17.457	1.00	19.12
ATOM	3001	O	GLU	A	391	−18.123	29.709	−17.906	1.00	19.40
ATOM	3002	N	ALA	A	392	−18.654	27.516	−17.991	1.00	18.81
ATOM	3003	CA	ALA	A	392	−17.861	27.304	−19.201	1.00	19.72
ATOM	3004	CB	ALA	A	392	−17.758	25.815	−19.526	1.00	19.45
ATOM	3005	C	ALA	A	392	−18.478	28.098	−20.363	1.00	19.59
ATOM	3006	O	ALA	A	392	−17.764	28.724	−21.157	1.00	18.65
ATOM	3007	N	ALA	A	393	−19.808	28.117	−20.425	1.00	20.40
ATOM	3008	CA	ALA	A	393	−20.526	28.820	−21.507	1.00	21.27
ATOM	3009	CB	ALA	A	393	−22.035	28.524	−21.421	1.00	21.83
ATOM	3010	C	ALA	A	393	−20.266	30.334	−21.574	1.00	21.79
ATOM	3011	O	ALA	A	393	−20.283	30.920	−22.664	1.00	21.96
ATOM	3012	N	LYS	A	394	−19.976	30.971	−20.435	1.00	21.37
ATOM	3013	CA	LYS	A	394	−19.626	32.383	−20.447	1.00	22.02
ATOM	3014	CB	LYS	A	394	−19.289	32.916	−19.043	1.00	23.11
ATOM	3015	CG	LYS	A	394	−20.411	32.980	−18.044	1.00	25.98
ATOM	3016	CD	LYS	A	394	−19.782	33.341	−16.700	1.00	28.89
ATOM	3017	CE	LYS	A	394	−20.793	33.314	−15.576	1.00	34.05
ATOM	3018	NZ	LYS	A	394	−20.097	33.674	−14.290	1.00	33.96
ATOM	3019	C	LYS	A	394	−18.403	32.626	−21.310	1.00	21.55
ATOM	3020	O	LYS	A	394	−18.188	33.742	−21.771	1.00	22.41
ATOM	3021	N	TYR	A	395	−17.570	31.604	−21.488	1.00	19.98
ATOM	3022	CA	TYR	A	395	−16.287	31.824	−22.132	1.00	19.46
ATOM	3023	CB	TYR	A	395	−15.137	31.464	−21.185	1.00	20.82
ATOM	3024	CG	TYR	A	395	−15.291	32.165	−19.872	1.00	22.04
ATOM	3025	CD1	TYR	A	395	−15.644	31.450	−18.716	1.00	23.21
ATOM	3026	CE1	TYR	A	395	−15.806	32.097	−17.508	1.00	23.70
ATOM	3027	CZ	TYR	A	395	−15.661	33.473	−17.460	1.00	23.93
ATOM	3028	OH	TYR	A	395	−15.828	34.143	−16.272	1.00	26.14
ATOM	3029	CE2	TYR	A	395	−15.327	34.202	−18.593	1.00	24.38
ATOM	3030	CD2	TYR	A	395	−15.157	33.548	−19.791	1.00	22.37
ATOM	3031	C	TYR	A	395	−16.157	31.119	−23.451	1.00	19.22
ATOM	3032	O	TYR	A	395	−15.045	30.940	−23.941	1.00	18.70
ATOM	3033	N	VAL	A	396	−17.299	30.718	−24.018	1.00	18.16
ATOM	3034	CA	VAL	A	396	−17.331	30.135	−25.352	1.00	19.03
ATOM	3035	CB	VAL	A	396	−18.396	29.025	−25.458	1.00	18.18
ATOM	3036	CG1	VAL	A	396	−18.469	28.465	−26.898	1.00	18.63
ATOM	3037	CG2	VAL	A	396	−18.094	27.915	−24.452	1.00	18.97
ATOM	3038	C	VAL	A	396	−17.654	31.288	−26.308	1.00	19.65

TABLE 15-continued

ATOM	3039	O	VAL	A	396	−18.644	31.986	−26.098	1.00	19.66
ATOM	3040	N	PRO	A	397	−16.810	31.507	−27.328	1.00	20.41
ATOM	3041	CA	PRO	A	397	−17.016	32.626	−28.256	1.00	20.82
ATOM	3042	CB	PRO	A	397	−15.794	32.561	−29.175	1.00	21.47
ATOM	3043	CG	PRO	A	397	−14.819	31.725	−28.475	1.00	21.69
ATOM	3044	CD	PRO	A	397	−15.598	30.741	−27.661	1.00	19.70
ATOM	3045	C	PRO	A	397	−18.280	32.434	−29.073	1.00	21.11
ATOM	3046	O	PRO	A	397	−18.844	31.339	−29.088	1.00	19.88
ATOM	3047	N	ALA	A	398	−18.713	33.492	−29.765	1.00	21.26
ATOM	3048	CA	ALA	A	398	−19.951	33.424	−30.559	1.00	21.44
ATOM	3049	CB	ALA	A	398	−20.227	34.766	−31.230	1.00	22.38
ATOM	3050	C	ALA	A	398	−19.971	32.297	−31.587	1.00	21.30
ATOM	3051	O	ALA	A	398	−21.038	31.769	−31.901	1.00	22.15
ATOM	3052	N	ASP	A	399	−18.804	31.896	−32.102	1.00	20.30
ATOM	3053	CA	ASP	A	399	−18.780	30.858	−33.133	1.00	19.40
ATOM	3054	CB	ASP	A	399	−17.587	31.032	−34.071	1.00	19.42
ATOM	3055	CG	ASP	A	399	−16.233	30.835	−33.381	1.00	21.84
ATOM	3056	OD1	ASP	A	399	−16.146	30.569	−32.159	1.00	20.91
ATOM	3057	OD2	ASP	A	399	−15.229	30.950	−34.104	1.00	24.62
ATOM	3058	C	ASP	A	399	−18.834	29.435	−32.579	1.00	18.14
ATOM	3059	O	ASP	A	399	−18.802	28.465	−33.350	1.00	16.78
ATOM	3060	N	GLY	A	400	−18.891	29.322	−31.245	1.00	16.82
ATOM	3061	CA	GLY	A	400	−18.996	28.015	−30.607	1.00	15.41
ATOM	3062	C	GLY	A	400	−17.693	27.229	−30.556	1.00	15.07
ATOM	3063	O	GLY	A	400	−17.704	26.041	−30.203	1.00	15.23
ATOM	3064	N	SER	A	401	−16.572	27.861	−30.882	1.00	14.21
ATOM	3065	CA	SER	A	401	−15.312	27.119	−30.893	1.00	14.76
ATOM	3066	CB	SER	A	401	−14.241	27.840	−31.718	1.00	14.71
ATOM	3067	OG	SER	A	401	−14.059	29.160	−31.257	1.00	16.86
ATOM	3068	C	SER	A	401	−14.815	26.866	−29.448	1.00	14.38
ATOM	3069	O	SER	A	401	−14.992	21.111	−28.562	1.00	14.58
ATOM	3070	N	LEU	A	402	−14.169	25.720	−29.249	1.00	13.54
ATOM	3071	CA	LEU	A	402	−13.603	25.364	−27.968	1.00	13.21
ATOM	3072	CB	LEU	A	402	−14.271	24.080	−27.450	1.00	13.42
ATOM	3073	CG	LEU	A	402	−15.776	24.192	−27.162	1.00	14.06
ATOM	3074	CD1	LEU	A	402	−16.289	22.834	−26.668	1.00	13.87
ATOM	3075	CD2	LEU	A	402	−15.997	25.264	−26.109	1.00	17.00
ATOM	3076	C	LEU	A	402	−12.111	25.143	−28.109	1.00	12.99
ATOM	3077	O	LEU	A	402	−11.695	24.166	−28.707	1.00	13.19
ATOM	3078	N	ALA	A	403	−11.320	26.070	−27.578	1.00	13.02
ATOM	3079	CA	ALA	A	403	−9.884	25.870	−27.454	1.00	12.06
ATOM	3080	CB	ALA	A	403	−9.194	27.226	−27.220	1.00	11.77
ATOM	3081	C	ALA	A	403	−9.591	24.907	−26.300	1.00	12.81
ATOM	3082	O	ALA	A	403	−10.508	24.315	−25.714	1.00	12.36
ATOM	3083	N	GLU	A	404	−8.308	24.772	−25.959	1.00	11.39
ATOM	3084	CA	GLU	A	404	−7.918	23.922	−24.855	1.00	11.47
ATOM	3085	CB	GLU	A	404	−6.412	23.689	−24.931	1.00	11.02
ATOM	3086	CG	GLU	A	404	−5.865	22.723	−23.873	1.00	11.30
ATOM	3087	CD	GLU	A	404	−4.363	22.669	−23.954	1.00	12.25
ATOM	3088	OE1	GLU	A	404	−3.729	23.692	−23.622	1.00	12.06
ATOM	3089	OE2	GLU	A	404	−3.818	21.624	−24.390	1.00	12.60
ATOM	3090	C	GLU	A	404	−8.246	24.635	−23.538	1.00	11.77
ATOM	3091	O	GLU	A	404	−8.755	24.006	−22.590	1.00	11.08
ATOM	3092	N	GLN	A	405	−7.890	25.924	−23.453	1.00	12.07
ATOM	3093	CA	GLN	A	405	−7.952	26.655	−22.196	1.00	13.33
ATOM	3094	CB	GLN	A	405	−6.539	26.986	−21.678	1.00	13.24
ATOM	3095	CG	GLN	A	405	−5.625	25.821	−21.553	1.00	15.96
ATOM	3096	CD	GLN	A	405	−4.229	26.213	−21.051	1.00	14.97
ATOM	3097	OE1	GLN	A	405	−4.068	27.130	−20.236	1.00	15.09
ATOM	3098	NE2	GLN	A	405	−3.236	25.475	−21.496	1.00	15.87
ATOM	3099	C	GLN	A	405	−8.687	27.985	−22.356	1.00	13.51
ATOM	3100	O	GLN	A	405	−8.870	28.475	−23.489	1.00	13.74
ATOM	3101	N	PHE	A	406	−9.041	28.587	−21.226	1.00	12.60
ATOM	3102	CA	PHE	A	406	−9.516	29.990	−21.207	1.00	13.82
ATOM	3103	CB	PHE	A	406	−11.058	30.104	−21.232	1.00	13.56
ATOM	3104	CG	PHE	A	406	−11.800	29.385	−20.123	1.00	15.20
ATOM	3105	CD1	PHE	A	406	−12.155	28.026	−20.242	1.00	16.33
ATOM	3106	CE1	PHE	A	406	−12.879	27.370	−19.239	1.00	16.80
ATOM	3107	CZ	PHE	A	406	−13.340	28.094	−18.114	1.00	16.74
ATOM	3108	CE2	PHE	A	406	−13.020	29.453	−17.993	1.00	15.37
ATOM	3109	CD2	PHE	A	406	−12.260	30.101	−19.000	1.00	17.56
ATOM	3110	C	PHE	A	406	−8.836	30.737	−20.078	1.00	13.80
ATOM	3111	O	PHE	A	406	−8.587	30.151	−19.018	1.00	14.02
ATOM	3112	N	ASP	A	407	−8.481	31.997	−20.321	1.00	14.98
ATOM	3113	CA	ASP	A	407	−7.547	32.726	−19.438	1.00	15.04
ATOM	3114	CB	ASP	A	407	−7.237	34.115	−20.032	1.00	15.99
ATOM	3115	CG	ASP	A	407	−6.159	34.829	−19.293	1.00	18.17
ATOM	3116	OD1	ASP	A	407	−6.474	35.508	−18.293	1.00	20.41
ATOM	3117	OD2	ASP	A	407	−4.993	34.683	−19.685	1.00	20.75
ATOM	3118	C	ASP	A	407	−8.100	32.829	−18.005	1.00	14.54

TABLE 15-continued

ATOM	3119	O	ASP	A	407	−9.257	33.185	−17.800	1.00	15.12
ATOM	3120	N	ARG	A	408	−7.248	32.548	−17.018	1.00	14.63
ATOM	3121	CA	ARG	A	408	−7.644	32.530	−15.609	1.00	15.33
ATOM	3122	CB	ARG	A	408	−6.453	32.095	−14.753	1.00	15.32
ATOM	3123	CG	ARG	A	408	−5.236	33.062	−14.828	1.00	14.48
ATOM	3124	CD	ARG	A	408	−4.009	32.479	−14.122	1.00	16.22
ATOM	3125	NE	ARG	A	408	−4.237	32.248	−12.695	1.00	15.55
ATOM	3126	CZ	ARG	A	408	−3.613	31.323	−11.961	1.00	18.66
ATOM	3127	NH1	ARG	A	408	−3.878	31.231	−10.658	1.00	17.51
ATOM	3128	NH2	ARG	A	408	−2.717	30.499	−12.511	1.00	17.12
ATOM	3129	C	ARG	A	408	−8.167	33.886	−15.108	1.00	16.66
ATOM	3130	O	ARG	A	408	−8.898	33.943	−14.110	1.00	16.82
ATOM	3131	N	ASN	A	409	−7.781	34.964	−15.790	1.00	18.00
ATOM	3132	CA	ASN	A	409	−8.252	36.316	−15.421	1.00	20.06
ATOM	3133	CB	ASN	A	409	−7.069	37.275	−15.355	1.00	20.32
ATOM	3134	CG	ASN	A	409	−6.119	36.937	−14.224	1.00	21.65
ATOM	3135	OD1	ASN	A	409	−6.549	36.678	−13.111	1.00	24.42
ATOM	3136	ND2	ASN	A	409	−4.830	36.914	−14.516	1.00	23.96
ATOM	3137	C	ASN	A	409	−9.320	36.903	−16.336	1.00	21.43
ATOM	3138	O	ASN	A	409	−10.272	37.524	−15.857	1.00	22.03
ATOM	3139	N	SER	A	410	−9.152	36.724	−17.646	1.00	22.25
ATOM	3140	CA	SER	A	410	−10.007	37.410	−18.624	1.00	22.76
ATOM	3141	CB	SER	A	410	−9.146	38.159	−19.636	1.00	23.45
ATOM	3142	OG	SER	A	410	−8.470	37.260	−20.495	1.00	23.38
ATOM	3143	C	SER	A	410	−10.971	36.472	−19.343	1.00	22.82
ATOM	3144	O	SER	A	410	−11.898	36.925	−20.010	1.00	23.59
ATOM	3145	N	GLY	A	411	−10.758	35.161	−19.238	1.00	21.64
ATOM	3146	CA	GLY	A	411	−11.668	34.221	−19.877	1.00	20.39
ATOM	3147	C	GLY	A	411	−11.476	34.087	−21.379	1.00	19.99
ATOM	3148	O	GLY	A	411	−12.223	33.368	−22.029	1.00	20.85
ATOM	3149	N	THR	A	412	−10.478	34.750	−21.941	1.00	19.04
ATOM	3150	CA	THR	A	412	−10.268	34.658	−23.383	1.00	20.25
ATOM	3151	CB	THR	A	412	−9.447	35.853	−23.922	1.00	21.81
ATOM	3152	OG1	THR	A	412	−8.187	35.900	−23.257	1.00	26.24
ATOM	3153	CG2	THR	A	412	−10.160	37.163	−23.631	1.00	23.82
ATOM	3154	C	THR	A	412	−9.615	33.294	−23.732	1.00	19.17
ATOM	3155	O	THR	A	412	−8.786	32.796	−22.970	1.00	17.70
ATOM	3156	N	PRO	A	413	−9.996	32.688	−24.874	1.00	18.84
ATOM	3157	CA	PRO	A	413	−9.466	31.348	−25.234	1.00	18.32
ATOM	3158	CB	PRO	A	413	−10.220	31.002	−26.525	1.00	18.75
ATOM	3159	CG	PRO	A	413	−11.513	31.928	−26.451	1.00	19.42
ATOM	3160	CD	PRO	A	413	−10.943	33.195	−25.891	1.00	19.40
ATOM	3161	C	PRO	A	413	−7.959	31.399	−25.464	1.00	18.87
ATOM	3162	O	PRO	A	413	−7.436	32.406	−25.955	1.00	18.20
ATOM	3163	N	LEU	A	414	−7.253	30.353	−25.051	1.00	18.44
ATOM	3164	CA	LEU	A	414	−5.822	30.275	−25.305	1.00	18.90
ATOM	3165	CB	LEU	A	414	−4.992	30.974	−24.208	1.00	21.66
ATOM	3166	CG	LEU	A	414	−5.019	30.574	−22.754	1.00	24.35
ATOM	3167	CD1	LEU	A	414	−4.134	31.484	−21.892	1.00	27.42
ATOM	3168	CD2	LEU	A	414	−6.406	30.669	−22.224	1.00	30.77
ATOM	3169	C	LEU	A	414	−5.362	28.854	−25.518	1.00	17.24
ATOM	3170	O	LEU	A	414	−6.138	27.913	−25.406	1.00	15.97
ATOM	3171	N	SER	A	415	−4.091	28.733	−25.865	1.00	15.34
ATOM	3172	CA	SER	A	415	−3.473	27.481	−26.257	1.00	15.28
ATOM	3173	CB	SER	A	415	−3.434	26.468	−25.101	1.00	14.94
ATOM	3174	OG	SER	A	415	−2.632	25.355	−25.445	1.00	14.00
ATOM	3175	C	SER	A	415	−4.141	26.932	−27.528	1.00	15.13
ATOM	3176	O	SER	A	415	−4.665	27.718	−28.334	1.00	14.92
ATOM	3177	N	ALA	A	416	−4.097	25.618	−27.714	1.00	14.27
ATOM	3178	CA	ALA	A	416	−4.540	24.977	−28.976	1.00	14.25
ATOM	3179	CB	ALA	A	416	−4.380	23.486	−28.889	1.00	13.68
ATOM	3180	C	ALA	A	416	−5.981	25.314	−29.315	1.00	14.33
ATOM	3181	O	ALA	A	416	−6.854	25.216	−28.459	1.00	14.09
ATOM	3182	N	LEU	A	417	−6.223	25.680	−30.567	1.00	13.34
ATOM	3183	CA	LEU	A	417	−7.584	25.985	−31.006	1.00	14.22
ATOM	3184	CB	LEU	A	417	−7.536	26.931	−32.194	1.00	16.32
ATOM	3185	CG	LEU	A	417	−6.841	28.283	−31.942	1.00	18.75
ATOM	3186	CD1	LEU	A	417	−7.005	29.127	−33.163	1.00	23.81
ATOM	3187	CD2	LEU	A	417	−7.419	28.991	−30.712	1.00	21.76
ATOM	3188	C	LEU	A	417	−8.279	24.687	−31.413	1.00	13.18
ATOM	3189	O	LEU	A	417	−7.610	23.712	−31.775	1.00	13.19
ATOM	3190	N	HIS	A	418	−9.609	24.658	−31.311	1.00	12.26
ATOM	3191	CA	HIS	A	418	−10.399	23.496	−31.764	1.00	11.77
ATOM	3192	CB	HIS	A	418	−10.487	23.454	−33.303	1.00	13.41
ATOM	3193	CG	HIS	A	418	−11.294	24.566	−33.898	1.00	14.68
ATOM	3194	ND1	HIS	A	418	−12.646	24.717	−33.660	1.00	16.00
ATOM	3195	CE1	HIS	A	418	−13.095	25.762	−34.341	1.00	17.83
ATOM	3196	NE2	HIS	A	418	−12.085	26.290	−35.015	1.00	17.38
ATOM	3197	CD2	HIS	A	418	−10.948	25.557	−34.763	1.00	17.65
ATOM	3198	C	HIS	A	418	−9.826	22.187	−31.206	1.00	12.24

TABLE 15-continued

ATOM	3199	O	HIS	A	418	−9.540	21.250	−31.947	1.00	12.10
ATOM	3200	N	LEU	A	419	−9.656	22.116	−29.880	1.00	10.99
ATOM	3201	CA	LEU	A	419	−9.152	20.881	−29.301	1.00	10.46
ATOM	3202	CB	LEU	A	419	−8.742	21.069	−27.826	1.00	10.91
ATOM	3203	CG	LEU	A	419	−7.983	19.883	−27.220	1.00	10.16
ATOM	3204	CD1	LEU	A	419	−6.524	19.944	−27.669	1.00	11.45
ATOM	3205	CD2	LEU	A	419	−8.080	19.960	−25.657	1.00	10.73
ATOM	3206	C	LEU	A	419	−10.215	19.812	−29.398	1.00	10.49
ATOM	3207	O	LEU	A	419	−11.312	19.973	−28.863	1.00	10.67
ATOM	3208	N	THR	A	420	−9.860	18.686	−30.021	1.00	10.22
ATOM	3209	CA	THR	A	420	−10.833	17.629	−30.296	1.00	10.90
ATOM	3210	CB	THR	A	420	−10.201	16.460	−31.096	1.00	11.55
ATOM	3211	OG1	THR	A	420	−9.357	16.999	−32.115	1.00	12.00
ATOM	3212	CG2	THR	A	420	−11.310	15.625	−31.786	1.00	12.52
ATOM	3213	C	THR	A	420	−11.426	17.135	−28.995	1.00	11.43
ATOM	3214	O	THR	A	420	−12.648	16.903	−28.891	1.00	11.83
ATOM	3215	N	TRP	A	421	−10.569	16.987	−27.980	1.00	9.79
ATOM	3216	CA	TRP	A	421	−11.052	16.511	−26.688	1.00	11.67
ATOM	3217	CB	TRP	A	421	−9.839	16.184	−25.803	1.00	12.06
ATOM	3218	CG	TRP	A	421	−10.075	15.476	−24.508	1.00	11.94
ATOM	3219	CD1	TRP	A	421	−11.274	15.202	−23.881	1.00	14.46
ATOM	3220	NE1	TRP	A	421	−11.044	14.590	−22.663	1.00	14.38
ATOM	3221	CE2	TRP	A	421	−9.691	14.497	−22.468	1.00	13.52
ATOM	3222	CD2	TRP	A	421	−9.053	15.039	−23.616	1.00	13.01
ATOM	3223	CE3	TRP	A	421	−7.652	15.045	−23.680	1.00	15.38
ATOM	3224	CZ3	TRP	A	421	−6.932	14.503	−22.605	1.00	16.10
ATOM	3225	CH2	TRP	A	421	−7.603	13.973	−21.475	1.00	14.87
ATOM	3226	CZ2	TRP	A	421	−8.973	13.945	−21.398	1.00	14.27
ATOM	3227	C	TRP	A	421	−12.035	17.514	−26.032	1.00	10.89
ATOM	3228	O	TRP	A	421	−12.966	17.092	−25.357	1.00	10.96
ATOM	3229	N	SER	A	422	−11.844	18.822	−26.211	1.00	10.49
ATOM	3230	CA	SER	A	422	−12.833	19.794	−25.696	1.00	11.13
ATOM	3231	CB	SER	A	422	−12.459	21.243	−26.049	1.00	10.97
ATOM	3232	OG	SER	A	422	−11.302	21.682	−25.338	1.00	13.73
ATOM	3233	C	SER	A	422	−14.229	19.496	−26.257	1.00	11.40
ATOM	3234	O	SER	A	422	−15.204	19.468	−25.530	1.00	12.11
ATOM	3235	N	TYR	A	423	−14.320	19.281	−27.563	1.00	11.29
ATOM	3236	CA	TYR	A	423	−15.617	18.990	−28.170	1.00	11.29
ATOM	3237	CB	TYR	A	423	−15.502	19.020	−29.717	1.00	11.85
ATOM	3238	CG	TYR	A	423	−15.132	20.389	−30.274	1.00	12.18
ATOM	3239	CD1	TYR	A	423	−16.002	21.485	−30.145	1.00	10.35
ATOM	3240	CE1	TYR	A	423	−15.668	22.741	−30.643	1.00	11.83
ATOM	3241	CZ	TYR	A	423	−14.468	22.912	−31.316	1.00	12.29
ATOM	3242	OH	TYR	A	423	−14.157	24.145	−31.783	1.00	13.08
ATOM	3243	CE2	TYR	A	423	−13.588	21.845	−31.496	1.00	13.57
ATOM	3244	CD2	TYR	A	423	−13.942	20.572	−30.991	1.00	12.74
ATOM	3245	C	TYR	A	423	−16.217	17.673	−27.658	1.00	12.12
ATOM	3246	O	TYR	A	423	−17.430	17.622	−27.323	1.00	12.13
ATOM	3247	N	ALA	A	424	−15.385	16.623	−27.539	1.00	10.99
ATOM	3248	CA	ALA	A	424	−15.853	15.337	−26.986	1.00	11.26
ATOM	3249	CB	ALA	A	424	−14.717	14.294	−26.952	1.00	11.73
ATOM	3250	C	ALA	A	424	−16.411	15.535	−25.588	1.00	10.93
ATOM	3251	O	ALA	A	424	−17.465	14.974	−25.246	1.00	11.68
ATOM	3252	N	SER	A	425	−15.696	16.308	−24.770	1.00	9.74
ATOM	3253	CA	SER	A	425	−16.077	16.519	−23.379	1.00	10.92
ATOM	3254	CB	SER	A	425	−14.948	17.228	−22.602	1.00	11.59
ATOM	3255	OG	SER	A	425	−14.817	18.604	−22.957	1.00	13.86
ATOM	3256	C	SER	A	425	−17.402	17.291	−23.219	1.00	11.65
ATOM	3257	O	SER	A	425	−18.132	17.043	−22.276	1.00	11.86
ATOM	3258	N	PHE	A	426	−17.683	18.220	−24.133	1.00	12.13
ATOM	3259	CA	PHE	A	426	−18.983	18.891	−24.154	1.00	12.95
ATOM	3260	CB	PHE	A	426	−19.018	20.053	−25.173	1.00	13.14
ATOM	3261	CG	PHE	A	426	−20.410	20.575	−25.391	1.00	15.93
ATOM	3262	CD1	PHE	A	426	−20.951	21.522	−24.516	1.00	17.76
ATOM	3263	CE1	PHE	A	426	−22.279	21.980	−24.688	1.00	17.49
ATOM	3264	CZ	PHE	A	426	−23.064	21.455	−25.716	1.00	17.22
ATOM	3265	CE2	PHE	A	426	−22.561	20.496	−26.558	1.00	17.04
ATOM	3266	CD2	PHE	A	426	−21.225	20.045	−26.396	1.00	17.29
ATOM	3267	C	PHE	A	426	−20.079	17.878	−24.502	1.00	13.31
ATOM	3268	O	PHE	A	426	−21.120	17.827	−23.850	1.00	13.38
ATOM	3269	N	LEU	A	427	−19.834	17.077	−25.539	1.00	13.23
ATOM	3270	CA	LEU	A	427	−20.811	16.090	−25.996	1.00	14.41
ATOM	3271	CB	LEU	A	427	−20.339	15.410	−27.291	1.00	14.32
ATOM	3272	CG	LEU	A	427	−20.363	16.336	−28.506	1.00	15.96
ATOM	3273	CD1	LEU	A	427	−19.661	15.639	−29.689	1.00	18.66
ATOM	3274	CD2	LEU	A	427	−21.773	16.800	−28.876	1.00	16.20
ATOM	3275	C	LEU	A	427	−21.137	15.045	−24.959	1.00	14.86
ATOM	3276	O	LEU	A	427	−22.307	14.667	−24.833	1.00	16.01
ATOM	3277	N	THR	A	428	−20.130	14.551	−24.235	1.00	13.81
ATOM	3278	CA	THR	A	428	−20.397	13.544	−23.196	1.00	13.67

TABLE 15-continued

ATOM	3279	CB	THR	A	428	−19.134	12.732	−22.745	1.00	12.87
ATOM	3280	OG1	THR	A	428	−18.127	13.597	−22.185	1.00	12.33
ATOM	3281	CG2	THR	A	428	−18.533	11.902	−23.923	1.00	13.77
ATOM	3282	C	THR	A	428	−21.146	14.133	−21.980	1.00	13.66
ATOM	3283	O	THR	A	428	−22.102	13.517	−21.478	1.00	15.09
ATOM	3284	N	ALA	A	429	−20.738	15.312	−21.524	1.00	13.72
ATOM	3285	CA	ALA	A	429	−21.367	15.942	−20.355	1.00	14.65
ATOM	3286	CB	ALA	A	429	−20.704	17.295	−20.036	1.00	14.11
ATOM	3287	C	ALA	A	429	−22.852	16.158	−20.643	1.00	15.47
ATOM	3288	O	ALA	A	429	−23.704	15.908	−19.783	1.00	15.97
ATOM	3289	N	THR	A	430	−23.151	16.622	−21.854	1.00	15.48
ATOM	3290	CA	THR	A	430	−24.554	16.940	−22.208	1.00	15.64
ATOM	3291	CB	THR	A	430	−24.675	17.968	−23.353	1.00	16.50
ATOM	3292	OG1	THR	A	430	−23.980	17.494	−24.514	1.00	16.24
ATOM	3293	CG2	THR	A	430	−24.101	19.317	−22.916	1.00	16.43
ATOM	3294	C	THR	A	430	−25.401	15.690	−22.463	1.00	15.41
ATOM	3295	O	THR	A	430	−26.611	15.674	−22.158	1.00	15.67
ATOM	3296	N	ALA	A	431	−24.772	14.632	−22.968	1.00	15.22
ATOM	3297	CA	ALA	A	431	−25.437	13.311	−23.049	1.00	16.26
ATOM	3298	CB	ALA	A	431	−24.560	12.300	−23.762	1.00	16.39
ATOM	3299	C	ALA	A	431	−25.842	12.797	−21.673	1.00	16.53
ATOM	3300	O	ALA	A	431	−26.985	12.319	−21.485	1.00	16.61
ATOM	3301	N	ARG	A	432	−24.937	12.895	−20.689	1.00	15.66
ATOM	3302	CA	ARG	A	432	−25.256	12.410	−19.342	1.00	15.64
ATOM	3303	CB	ARG	A	432	−24.022	12.413	−18.432	1.00	15.83
ATOM	3304	CG	ARG	A	432	−22.862	11.574	−18.994	1.00	14.85
ATOM	3305	CD	ARG	A	432	−23.174	10.051	−19.154	1.00	17.10
ATOM	3306	NE	ARG	A	432	−21.958	9.472	−19.708	1.00	18.67
ATOM	3307	CZ	ARG	A	432	−21.766	9.225	−21.003	1.00	20.81
ATOM	3308	NH1	ARG	A	432	−22.769	9.372	−21.868	1.00	17.45
ATOM	3309	NH2	ARG	A	432	−20.576	8.781	−21.427	1.00	19.90
ATOM	3310	C	ARG	A	432	−26.375	13.235	−18.719	1.00	16.42
ATOM	3311	O	ARG	A	432	−27.256	12.685	−18.030	1.00	17.47
ATOM	3312	N	ARG	A	433	−26.371	14.535	−18.996	1.00	16.54
ATOM	3313	CA	ARG	A	433	−27.425	15.418	−18.493	1.00	17.60
ATOM	3314	CB	ARG	A	433	−27.204	16.852	−18.960	1.00	16.74
ATOM	3315	CG	ARG	A	433	−28.287	17.833	−18.461	1.00	18.39
ATOM	3316	CD	ARG	A	433	−27.931	19.239	−18.866	1.00	20.79
ATOM	3317	NE	ARG	A	433	−28.739	20.260	−18.166	1.00	23.05
ATOM	3318	CZ	ARG	A	433	−29.859	20.799	−18.654	1.00	26.97
ATOM	3319	NH1	ARG	A	433	−30.333	20.404	−19.837	1.00	24.94
ATOM	3320	NH2	ARG	A	433	−30.506	21.738	−17.954	1.00	25.73
ATOM	3321	C	ARG	A	433	−28.793	14.943	−18.956	1.00	17.90
ATOM	3322	O	ARG	A	433	−29.761	14.984	−18.184	1.00	18.50
ATOM	3323	N	ALA	A	434	−28.861	14.502	−20.210	1.00	18.06
ATOM	3324	CA	ALA	A	434	−30.103	13.993	−20.806	1.00	19.10
ATOM	3325	CB	ALA	A	434	−30.067	14.202	−22.318	1.00	19.95
ATOM	3326	C	ALA	A	434	−30.399	12.532	−20.475	1.00	20.48
ATOM	3327	O	ALA	A	434	−31.371	11.975	−20.980	1.00	21.63
ATOM	3328	N	GLY	A	435	−29.594	11.904	−19.620	1.00	19.94
ATOM	3329	CA	GLY	A	435	−29.865	10.531	−19.182	1.00	21.09
ATOM	3330	C	GLY	A	435	−29.415	9.475	−20.188	1.00	21.57
ATOM	3331	O	GLY	A	435	−29.847	8.304	−20.130	1.00	21.64
ATOM	3332	N	ILE	A	436	−28.529	9.873	−21.100	1.00	20.44
ATOM	3333	CA	ILE	A	436	−27.951	8.937	−22.060	1.00	20.81
ATOM	3334	CB	ILE	A	436	−27.753	9.601	−23.447	1.00	20.75
ATOM	3335	CG1	ILE	A	436	−29.132	9.977	−24.027	1.00	23.03
ATOM	3336	CD1	ILE	A	436	−29.103	11.031	−25.128	1.00	26.34
ATOM	3337	CG2	ILE	A	436	−27.031	8.643	−24.395	1.00	21.35
ATOM	3338	C	ILE	A	436	−26.634	8.412	−21.485	1.00	20.99
ATOM	3339	O	ILE	A	436	−25.666	9.171	−21.339	1.00	20.46
ATOM	3340	N	VAL	A	437	−26.616	7.120	−21.162	1.00	20.70
ATOM	3341	CA	VAL	A	437	−25.465	6.479	−20.517	1.00	21.39
ATOM	3342	CB	VAL	A	437	−25.848	5.826	−19.160	1.00	21.74
ATOM	3343	CG1	VAL	A	437	−26.340	6.911	−18.205	1.00	22.12
ATOM	3344	CG2	VAL	A	437	−26.909	4.703	−19.334	1.00	21.83
ATOM	3345	C	VAL	A	437	−24.802	5.459	−21.444	1.00	21.79
ATOM	3346	O	VAL	A	437	−25.459	4.901	−22.312	1.00	22.18
ATOM	3347	N	PRO	A	438	−23.497	5.208	−21.255	1.00	22.28
ATOM	3348	CA	PRO	A	438	−22.837	4.291	−22.181	1.00	22.83
ATOM	3349	CB	PRO	A	438	−21.365	4.642	−22.009	1.00	22.45
ATOM	3350	CG	PRO	A	438	−21.248	5.054	−20.578	1.00	23.88
ATOM	3351	CD	PRO	A	438	−22.575	5.707	−20.214	1.00	22.50
ATOM	3352	C	PRO	A	438	−23.093	2.840	−21.753	1.00	22.80
ATOM	3353	O	PRO	A	438	−23.580	2.604	−20.626	1.00	23.06
ATOM	3354	N	PRO	A	439	−22.796	1.878	−22.639	1.00	22.65
ATOM	3355	CA	PRO	A	439	−22.911	0.452	−22.283	1.00	22.08
ATOM	3356	CB	PRO	A	439	−22.300	−0.269	−23.499	1.00	21.30
ATOM	3357	CG	PRO	A	439	−22.526	0.664	−24.618	1.00	22.81
ATOM	3358	CD	PRO	A	439	−22.391	2.062	−24.050	1.00	22.29

TABLE 15-continued

ATOM	3359	C	PRO	A	439	−22.122	0.129	−21.037	1.00	21.88
ATOM	3360	O	PRO	A	439	−21.075	0.750	−20.776	1.00	20.95
ATOM	3361	N	SER	A	440	−22.628	−0.818	−20.253	1.00	22.34
ATOM	3362	CA	SER	A	440	−21.932	−1.273	−19.060	1.00	23.42
ATOM	3363	CB	SER	A	440	−22.818	−2.195	−18.224	1.00	24.01
ATOM	3364	OG	SER	A	440	−23.805	−1.412	−17.566	1.00	26.78
ATOM	3365	C	SER	A	440	−20.654	−1.992	−19.430	1.00	23.78
ATOM	3366	O	SER	A	440	−20.540	−2.554	−20.522	1.00	23.97
ATOM	3367	N	TRP	A	441	−19.681	−1.929	−18.536	1.00	24.15
ATOM	3368	CA	TRP	A	441	−18.431	−2.646	−18.718	1.00	24.63
ATOM	3369	CB	TRP	A	441	−17.255	−1.679	−18.819	1.00	22.62
ATOM	3370	CG	TRP	A	441	−16.963	−0.837	−17.583	1.00	19.24
ATOM	3371	CD1	TRP	A	441	−17.409	0.432	−17.339	1.00	16.95
ATOM	3372	NE1	TRP	A	441	−16.909	0.878	−16.138	1.00	17.89
ATOM	3373	CE2	TRP	A	441	−16.111	−0.098	−15.595	1.00	17.88
ATOM	3374	CD2	TRP	A	441	−16.130	−1.194	−16.476	1.00	18.22
ATOM	3375	CE3	TRP	A	441	−15.377	−2.338	−16.149	1.00	19.64
ATOM	3376	CZ3	TRP	A	441	−14.658	−2.355	−14.961	1.00	18.61
ATOM	3377	CH2	TRP	A	441	−14.670	−1.246	−14.094	1.00	20.62
ATOM	3378	CZ2	TRP	A	441	−15.400	−0.114	−14.391	1.00	19.39
ATOM	3379	C	TRP	A	441	−18.179	−3.661	−17.625	1.00	26.71
ATOM	3380	O	TRP	A	441	−17.410	−4.592	−17.813	1.00	25.60
ATOM	3381	N	ALA	A	442	−18.798	−3.471	−16.468	1.00	29.78
ATOM	3382	CA	ALA	A	442	−18.442	−4.292	−15.330	1.00	33.94
ATOM	3383	CB	ALA	A	442	−18.347	−3.447	−14.082	1.00	33.18
ATOM	3384	C	ALA	A	442	−19.447	−5.412	−15.136	1.00	37.28
ATOM	3385	O	ALA	A	442	−20.383	−5.561	−15.915	1.00	38.51
ATOM	3386	N	ASN	A	443	−19.201	−6.222	−14.116	1.00	41.45
ATOM	3387	CA	ASN	A	443	−20.226	−7.030	−13.467	1.00	45.10
ATOM	3388	CB	ASN	A	443	−20.135	−8.490	−13.914	1.00	45.75
ATOM	3389	CG	ASN	A	443	−18.815	−9.129	−13.531	1.00	48.14
ATOM	3390	OD1	ASN	A	443	−18.620	−9.524	−12.380	1.00	50.51
ATOM	3391	ND2	ASN	A	443	−17.888	−9.212	−14.492	1.00	50.01
ATOM	3392	C	ASN	A	443	−19.946	−6.892	−11.972	1.00	46.93
ATOM	3393	O	ASN	A	443	−18.878	−6.396	−11.580	1.00	47.13
ATOM	3394	N	SER	A	444	−20.873	−7.343	−11.135	1.00	49.21
ATOM	3395	CA	SER	A	444	−20.719	−7.201	−9.684	1.00	51.08
ATOM	3396	CB	SER	A	444	−21.713	−8.096	−8.936	1.00	51.21
ATOM	3397	OG	SER	A	444	−21.738	−7.735	−7.563	1.00	52.90
ATOM	3398	C	SER	A	444	−19.291	−7.452	−9.165	1.00	51.89
ATOM	3399	O	SER	A	444	−18.743	−6.610	−8.433	1.00	52.46
ATOM	3400	N	SER	A	445	−18.700	−8.588	−9.558	1.00	52.45
ATOM	3401	CA	SER	A	445	−17.400	−9.030	−9.029	1.00	52.98
ATOM	3402	CB	SER	A	445	−17.138	−10.497	−9.385	1.00	53.12
ATOM	3403	OG	SER	A	445	−16.901	−10.650	−10.775	1.00	54.45
ATOM	3404	C	SER	A	445	−16.202	−8.159	−9.449	1.00	52.99
ATOM	3405	O	SER	A	445	−15.184	−8.112	−8.738	1.00	53.28
ATOM	3406	N	ALA	A	446	−16.328	−7.472	−10.588	1.00	52.67
ATOM	3407	CA	ALA	A	446	−15.301	−6.536	−11.063	1.00	52.20
ATOM	3408	CB	ALA	A	446	−15.695	−5.960	−12.425	1.00	52.45
ATOM	3409	C	ALA	A	446	−14.996	−5.406	−10.059	1.00	51.92
ATOM	3410	O	ALA	A	446	−14.144	−4.553	−10.322	1.00	51.77
ATOM	3411	N	SER	A	447	−15.696	−5.413	−8.919	1.00	51.23
ATOM	3412	CA	SER	A	447	−15.471	−4.453	−7.827	1.00	50.73
ATOM	3413	CB	SER	A	447	−16.769	−3.706	−7.495	1.00	50.70
ATOM	3414	OG	SER	A	447	−17.765	−4.605	−7.021	1.00	50.91
ATOM	3415	C	SER	A	447	−14.886	−5.072	−6.537	1.00	50.31
ATOM	3416	O	SER	A	447	−14.604	−4.345	−5.580	1.00	50.16
ATOM	3417	N	THR	A	448	−14.704	−6.394	−6.508	1.00	49.55
ATOM	3418	CA	THR	A	448	−14.165	−7.070	−5.314	1.00	49.05
ATOM	3419	CB	THR	A	448	−14.579	−8.561	−5.233	1.00	49.15
ATOM	3420	OG1	THR	A	448	−14.076	−9.255	−6.378	1.00	49.97
ATOM	3421	CG2	THR	A	448	−16.096	−8.705	−5.180	1.00	49.11
ATOM	3422	C	THR	A	448	−12.641	−6.958	−5.215	1.00	48.34
ATOM	3423	O	THR	A	448	−11.911	−7.325	−6.135	1.00	47.84
ATOM	3424	N	ILE	A	449	−12.174	−6.444	−4.084	1.00	47.93
ATOM	3425	CA	ILE	A	449	−10.760	−6.150	−3.891	1.00	47.42
ATOM	3426	CB	ILE	A	449	−10.577	−4.798	−3.142	1.00	47.53
ATOM	3427	CG1	ILE	A	449	−11.346	−3.680	−3.863	1.00	46.60
ATOM	3428	CD1	ILE	A	449	−11.727	−2.523	−2.981	1.00	45.49
ATOM	3429	CG2	ILE	A	449	−9.097	−4.438	−2.999	1.00	46.84
ATOM	3430	C	ILE	A	449	−10.104	−7.299	−3.124	1.00	47.45
ATOM	3431	O	ILE	A	449	−10.606	−7.688	−2.067	1.00	47.66
ATOM	3432	N	PRO	A	450	−8.993	−7.857	−3.663	1.00	47.28
ATOM	3433	CA	PRO	A	450	−8.202	−8.926	−3.036	1.00	47.25
ATOM	3434	CB	PRO	A	450	−6.982	−9.040	−3.946	1.00	47.03
ATOM	3435	CG	PRO	A	450	−7.430	−8.535	−5.237	1.00	47.02
ATOM	3436	CD	PRO	A	450	−8.431	−7.470	−4.969	1.00	47.07
ATOM	3437	C	PRO	A	450	−7.731	−8.562	−1.639	1.00	47.48
ATOM	3438	O	PRO	A	450	−7.608	−7.377	−1.322	1.00	47.43

TABLE 15-continued

ATOM	3439	N	SER	A	451	−7.452	−9.587	−0.832	1.00	47.94
ATOM	3440	CA	SER	A	451	−7.020	−9.436	0.568	1.00	48.19
ATOM	3441	CB	SER	A	451	−7.017	−10.801	1.277	1.00	48.52
ATOM	3442	OG	SER	A	451	−8.297	−11.414	1.235	1.00	49.64
ATOM	3443	C	SER	A	451	−5.641	−8.799	0.701	1.00	47.83
ATOM	3444	O	SER	A	451	−5.415	−7.963	1.575	1.00	48.39
ATOM	3445	N	THR	A	452	−4.715	−9.212	−0.158	1.00	47.14
ATOM	3446	CA	THR	A	452	−3.379	−8.613	−0.211	1.00	46.42
ATOM	3447	CB	THR	A	452	−2.323	−9.540	0.434	1.00	46.66
ATOM	3448	OG1	THR	A	452	−2.518	−10.887	−0.032	1.00	48.38
ATOM	3449	CG2	THR	A	452	−2.446	−9.514	1.962	1.00	47.77
ATOM	3450	C	THR	A	452	−3.011	−8.323	−1.673	1.00	44.81
ATOM	3451	O	THR	A	452	−3.348	−9.107	−2.558	1.00	44.97
ATOM	3452	N	CYS	A	453	−2.363	−7.187	−1.931	1.00	43.37
ATOM	3453	CA	CYS	A	453	−1.971	−6.854	−3.306	1.00	41.40
ATOM	3454	CB	CYS	A	453	−1.918	−5.339	−3.574	1.00	41.01
ATOM	3455	SG	CYS	A	453	−3.187	−4.199	−2.908	1.00	40.58
ATOM	3456	C	CYS	A	453	−0.591	−7.408	−3.602	1.00	40.33
ATOM	3457	O	CYS	A	453	0.293	−7.370	−2.753	1.00	39.88
ATOM	3458	N	SER	A	454	−0.405	−7.911	−4.812	1.00	39.25
ATOM	3459	CA	SER	A	454	0.937	−8.142	−5.336	1.00	38.68
ATOM	3460	CB	SER	A	454	1.222	−9.638	−5.484	1.00	38.56
ATOM	3461	OG	SER	A	454	0.276	−10.251	−6.349	1.00	40.44
ATOM	3462	C	SER	A	454	1.047	−7.450	−6.690	1.00	37.78
ATOM	3463	O	SER	A	454	0.030	−7.187	−7.347	1.00	36.71
ATOM	3464	N	GLY	A	455	2.275	−7.175	−7.111	1.00	37.06
ATOM	3465	CA	GLY	A	455	2.514	−6.613	−8.431	1.00	36.79
ATOM	3466	C	GLY	A	455	2.493	−7.658	−9.539	1.00	36.18
ATOM	3467	O	GLY	A	455	3.410	−7.708	−10.367	1.00	36.73
ATOM	3468	N	ALA	A	456	1.445	−8.480	−9.562	1.00	35.26
ATOM	3469	CA	ALA	A	456	1.321	−9.584	−10.512	1.00	34.46
ATOM	3470	CB	ALA	A	456	0.125	−10.454	−10.158	1.00	34.50
ATOM	3471	C	ALA	A	456	1.195	−9.111	−11.963	1.00	34.16
ATOM	3472	O	ALA	A	456	0.283	−8.353	−12.301	1.00	33.56
ATOM	3473	N	SER	A	457	2.097	−9.588	−12.817	1.00	33.11
ATOM	3474	CA	SER	A	457	2.013	−9.302	−14.241	1.00	32.60
ATOM	3475	CB	SER	A	457	3.022	−8.219	−14.635	1.00	32.50
ATOM	3476	OG	SER	A	457	4.352	−8.691	−14.519	1.00	33.28
ATOM	3477	C	SER	A	457	2.228	−10.575	−15.044	1.00	32.31
ATOM	3478	O	SER	A	457	2.641	−11.605	−14.494	1.00	32.32
ATOM	3479	N	VAL	A	458	1.908	−10.511	−16.330	1.00	31.12
ATOM	3480	CA	VAL	A	458	2.063	−11.629	−17.246	1.00	31.09
ATOM	3481	CB	VAL	A	458	0.682	−12.199	−17.659	1.00	31.00
ATOM	3482	CG1	VAL	A	458	0.806	−13.173	−18.830	1.00	30.72
ATOM	3483	CG2	VAL	A	458	−0.014	−12.847	−16.459	1.00	31.08
ATOM	3484	C	VAL	A	458	2.817	−11.144	−18.480	1.00	30.88
ATOM	3485	O	VAL	A	458	2.401	−10.177	−19.126	1.00	29.70
ATOM	3486	N	VAL	A	459	3.924	−11.811	−18.805	1.00	30.81
ATOM	3487	CA	VAL	A	459	4.643	−11.525	−20.051	1.00	30.95
ATOM	3488	CB	VAL	A	459	6.046	−12.172	−20.071	1.00	31.34
ATOM	3489	CG1	VAL	A	459	6.664	−12.102	−21.492	1.00	30.45
ATOM	3490	CG2	VAL	A	459	6.947	−11.522	−19.030	1.00	32.03
ATOM	3491	C	VAL	A	459	3.805	−12.032	−21.227	1.00	31.37
ATOM	3492	O	VAL	A	459	3.443	−13.214	−21.288	1.00	31.84
ATOM	3493	N	GLY	A	460	3.480	−11.137	−22.154	1.00	30.71
ATOM	3494	CA	GLY	A	460	2.596	−11.495	−23.258	1.00	30.77
ATOM	3495	C	GLY	A	460	3.349	−11.799	−24.536	1.00	30.66
ATOM	3496	O	GLY	A	460	4.585	−11.773	−24.582	1.00	30.90
ATOM	3497	N	SER	A	461	2.606	−12.094	−25.584	1.00	30.44
ATOM	3498	CA	SER	A	461	3.219	−12.227	−26.877	1.00	31.06
ATOM	3499	CB	SER	A	461	3.301	−13.695	−27.308	1.00	31.44
ATOM	3500	OG	SER	A	461	2.018	−14.278	−27.419	1.00	34.77
ATOM	3501	C	SER	A	461	2.463	−11.357	−27.864	1.00	30.21
ATOM	3502	O	SER	A	461	1.246	−11.156	−27.736	1.00	30.87
ATOM	3503	N	TYR	A	462	3.192	−10.822	−28.836	1.00	28.84
ATOM	3504	CA	TYR	A	462	2.651	−9.797	−29.712	1.00	28.13
ATOM	3505	CB	TYR	A	462	3.365	−8.471	−29.426	1.00	26.74
ATOM	3506	CG	TYR	A	462	3.264	−8.098	−27.976	1.00	25.28
ATOM	3507	CD1	TYR	A	462	2.184	−7.335	−27.508	1.00	23.75
ATOM	3508	CE1	TYR	A	462	2.066	−7.022	−26.162	1.00	23.41
ATOM	3509	CZ	TYR	A	462	3.030	−7.458	−25.268	1.00	23.32
ATOM	3510	OH	TYR	A	462	2.907	−7.155	−23.941	1.00	23.50
ATOM	3511	CE2	TYR	A	462	4.113	−8.226	−25.698	1.00	22.57
ATOM	3512	CD2	TYR	A	462	4.223	−8.537	−27.050	1.00	24.71
ATOM	3513	C	TYR	A	462	2.844	−10.191	−31.152	1.00	28.83
ATOM	3514	O	TYR	A	462	3.898	−10.697	−31.529	1.00	29.33
ATOM	3515	N	SER	A	463	1.828	−9.973	−31.961	1.00	29.66
ATOM	3516	CA	SER	A	463	1.970	−10.202	−33.388	1.00	30.77
ATOM	3517	CB	SER	A	463	1.424	−11.574	−33.784	1.00	30.99
ATOM	3518	OG	SER	A	463	0.168	−11.815	−33.192	1.00	33.22

TABLE 15-continued

ATOM	3519	C	SER	A	463	1.311	−9.082	−34.170	1.00	31.28
ATOM	3520	O	SER	A	463	0.329	−8.481	−33.723	1.00	30.40
ATOM	3521	N	ARG	A	464	1.886	−8.789	−35.330	1.00	31.94
ATOM	3522	CA	ARG	A	464	1.377	−7.775	−36.225	1.00	32.97
ATOM	3523	CB	ARG	A	464	2.362	−7.620	−37.385	1.00	33.68
ATOM	3524	CG	ARG	A	464	2.353	−6.274	−38.061	1.00	36.94
ATOM	3525	CD	ARG	A	464	3.502	−6.206	−39.088	1.00	42.45
ATOM	3526	NE	ARG	A	464	4.794	−6.065	−38.415	1.00	45.53
ATOM	3527	CZ	ARG	A	464	5.416	−4.903	−38.227	1.00	47.50
ATOM	3528	NH1	ARG	A	464	4.882	−3.775	−38.688	1.00	49.50
ATOM	3529	NH2	ARG	A	464	6.580	−4.863	−37.592	1.00	48.59
ATOM	3530	C	ARG	A	464	−0.017	−8.171	−36.741	1.00	33.03
ATOM	3531	O	ARG	A	464	−0.166	−9.228	−37.358	1.00	33.00
ATOM	3532	N	PRO	A	465	−1.053	−7.333	−36.479	1.00	32.72
ATOM	3533	CA	PRO	A	465	−2.344	−7.593	−37.131	1.00	32.69
ATOM	3534	CB	PRO	A	465	−3.274	−6.504	−36.558	1.00	32.50
ATOM	3535	CG	PRO	A	465	−2.581	−5.981	−35.345	1.00	32.47
ATOM	3536	CD	PRO	A	465	−1.102	−6.134	−35.618	1.00	32.83
ATOM	3537	C	PRO	A	465	−2.189	−7.421	−38.642	1.00	33.30
ATOM	3538	O	PRO	A	465	−1.332	−6.661	−39.097	1.00	33.20
ATOM	3539	N	THR	A	466	−2.990	−8.136	−39.412	1.00	34.26
ATOM	3540	CA	THR	A	466	−2.810	−8.131	−40.855	1.00	35.62
ATOM	3541	CB	THR	A	466	−2.264	−9.486	−41.370	1.00	35.33
ATOM	3542	OG1	THR	A	466	−3.225	−10.512	−41.136	1.00	36.81
ATOM	3543	CG2	THR	A	466	−0.965	−9.848	−40.656	1.00	35.91
ATOM	3544	C	THR	A	466	−4.076	−7.711	−41.600	1.00	36.15
ATOM	3545	O	THR	A	466	−3.983	−7.077	−42.648	1.00	36.93
ATOM	3546	N	ALA	A	467	−5.242	−8.051	−41.048	1.00	36.82
ATOM	3547	CA	ALA	A	467	−6.540	−7.648	−41.609	1.00	37.30
ATOM	3548	CB	ALA	A	467	−7.663	−8.403	−40.930	1.00	37.04
ATOM	3549	C	ALA	A	467	−6.767	−6.136	−41.509	1.00	38.13
ATOM	3550	O	ALA	A	467	−6.715	−5.556	−40.417	1.00	37.96
ATOM	3551	N	THR	A	468	−7.011	−5.502	−42.653	1.00	38.66
ATOM	3552	CA	THR	A	468	−7.146	−4.050	−42.702	1.00	39.18
ATOM	3553	CB	THR	A	468	−5.970	−3.406	−43.428	1.00	39.43
ATOM	3554	OG1	THR	A	468	−5.955	−3.879	−44.778	1.00	40.06
ATOM	3555	CG2	THR	A	468	−4.637	−3.717	−42.734	1.00	39.67
ATOM	3556	C	THR	A	468	−8.405	−3.591	−43.427	1.00	39.33
ATOM	3557	O	THR	A	468	−8.468	−2.451	−43.890	1.00	39.79
ATOM	3558	N	SER	A	469	−9.403	−4.457	−43.529	1.00	39.12
ATOM	3559	CA	SER	A	469	−10.651	−4.065	−44.176	1.00	39.41
ATOM	3560	CB	SER	A	469	−10.624	−4.369	−45.684	1.00	39.77
ATOM	3561	OG	SER	A	469	−10.476	−5.763	−45.916	1.00	41.02
ATOM	3562	C	SER	A	469	−11.850	−4.732	−43.537	1.00	38.54
ATOM	3563	O	SER	A	469	−11.771	−5.856	−43.046	1.00	38.85
ATOM	3564	N	PHE	A	470	−12.962	−4.014	−43.558	1.00	38.00
ATOM	3565	CA	PHE	A	470	−14.216	−4.507	−43.031	1.00	37.29
ATOM	3566	CB	PHE	A	470	−14.880	−3.406	−42.220	1.00	36.87
ATOM	3567	CG	PHE	A	470	−14.277	−3.212	−40.865	1.00	35.43
ATOM	3568	CD1	PHE	A	470	−13.146	−2.428	−40.696	1.00	35.15
ATOM	3569	CE1	PHE	A	470	−12.589	−2.252	−39.437	1.00	33.73
ATOM	3570	CZ	PHE	A	470	−13.159	−2.852	−38.332	1.00	35.04
ATOM	3571	CE2	PHE	A	470	−14.292	−3.638	−38.479	1.00	36.26
ATOM	3572	CD2	PHE	A	470	−14.844	−3.816	−39.751	1.00	35.71
ATOM	3573	C	PHE	A	470	−15.128	−4.923	−44.181	1.00	37.34
ATOM	3574	O	PHE	A	470	−15.059	−4.337	−45.258	1.00	37.21
ATOM	3575	N	PRO	A	471	−15.987	−5.931	−43.959	1.00	37.46
ATOM	3576	CA	PRO	A	471	−16.983	−6.243	−44.985	1.00	38.04
ATOM	3577	CB	PRO	A	471	−17.790	−7.383	−44.361	1.00	37.60
ATOM	3578	CG	PRO	A	471	−16.877	−7.986	−43.337	1.00	38.09
ATOM	3579	CD	PRO	A	471	−16.093	−6.828	−42.795	1.00	37.31
ATOM	3580	C	PRO	A	471	−17.879	−5.033	−45.231	1.00	38.96
ATOM	3581	O	PRO	A	471	−18.108	−4.245	−44.306	1.00	38.78
ATOM	3582	N	PRO	A	472	−18.378	−4.869	−46.471	1.00	39.78
ATOM	3583	CA	PRO	A	472	−19.238	−3.723	−46.771	1.00	39.87
ATOM	3584	CB	PRO	A	472	−19.378	−3.780	−48.293	1.00	40.09
ATOM	3585	CG	PRO	A	472	−19.171	−5.225	−48.635	1.00	40.28
ATOM	3586	CD	PRO	A	472	−18.171	−5.740	−47.649	1.00	40.02
ATOM	3587	C	PRO	A	472	−20.604	−3.864	−46.114	1.00	39.75
ATOM	3588	O	PRO	A	472	−21.017	−4.980	−45.798	1.00	40.10
ATOM	3589	N	SER	A	473	−21.268	−2.734	−45.881	1.00	39.71
ATOM	3590	CA	SER	A	473	−22.675	−2.696	−45.467	1.00	39.61
ATOM	3591	CB	SER	A	473	−23.571	−3.070	−46.651	1.00	40.16
ATOM	3592	OG	SER	A	473	−23.468	−2.074	−47.658	1.00	42.55
ATOM	3593	C	SER	A	473	−23.043	−3.509	−44.221	1.00	38.94
ATOM	3594	O	SER	A	473	−24.041	−4.258	−44.210	1.00	39.07
ATOM	3595	N	GLN	A	474	−22.257	−3.340	−43.159	1.00	37.75
ATOM	3596	CA	GLN	A	474	−22.558	−3.993	−41.888	1.00	36.60
ATOM	3597	CB	GLN	A	474	−21.291	−4.205	−41.057	1.00	36.41
ATOM	3598	CG	GLN	A	474	−20.331	−5.169	−41.732	1.00	36.24

TABLE 15-continued

ATOM	3599	CD	GLN	A	474	−19.295	−5.757	−40.795	1.00	36.45
ATOM	3600	OE1	GLN	A	474	−18.478	−5.040	−40.211	1.00	35.30
ATOM	3601	NE2	GLN	A	474	−19.304	−7.077	−40.671	1.00	36.85
ATOM	3602	C	GLN	A	474	−23.620	−3.191	−41.149	1.00	36.40
ATOM	3603	O	GLN	A	474	−23.329	−2.444	−40.208	1.00	35.99
ATOM	3604	N	THR	A	475	−24.859	−3.350	−41.616	1.00	35.59
ATOM	3605	CA	THR	A	475	−26.012	−2.595	−41.148	1.00	35.20
ATOM	3606	CB	THR	A	475	−27.051	−2.478	−42.287	1.00	35.73
ATOM	3607	OG1	THR	A	475	−27.120	−3.737	−42.959	1.00	36.85
ATOM	3608	CG2	THR	A	475	−26.642	−1.418	−43.310	1.00	34.51
ATOM	3609	C	THR	A	475	−26.635	−3.256	−39.910	1.00	35.16
ATOM	3610	O	THR	A	475	−26.363	−4.420	−39.622	1.00	34.47
ATOM	3611	N	PRO	A	476	−27.453	−2.510	−39.148	1.00	35.36
ATOM	3612	CA	PRO	A	476	−27.990	−3.111	−37.923	1.00	36.40
ATOM	3613	CB	PRO	A	476	−28.567	−1.910	−37.167	1.00	36.04
ATOM	3614	CG	PRO	A	476	−28.890	−0.912	−38.230	1.00	35.98
ATOM	3615	CD	PRO	A	476	−27.907	−1.119	−39.339	1.00	35.70
ATOM	3616	C	PRO	A	476	−29.085	−4.171	−38.158	1.00	37.45
ATOM	3617	O	PRO	A	476	−29.654	−4.244	−39.254	1.00	36.95
ATOM	3618	N	LYS	A	477	−29.342	−4.984	−37.133	1.00	39.01
ATOM	3619	CA	LYS	A	477	−30.472	−5.911	−37.111	1.00	41.20
ATOM	3620	CB	LYS	A	477	−30.541	−6.641	−35.774	1.00	41.46
ATOM	3621	CG	LYS	A	477	−29.665	−7.850	−35.604	1.00	41.87
ATOM	3622	CD	LYS	A	477	−29.939	−8.517	−34.237	1.00	42.36
ATOM	3623	CE	LYS	A	477	−29.996	−7.497	−33.076	1.00	44.55
ATOM	3624	NZ	LYS	A	477	−29.705	−8.110	−31.718	1.00	44.56
ATOM	3625	C	LYS	A	477	−31.766	−5.118	−37.230	1.00	42.27
ATOM	3626	O	LYS	A	477	−31.818	−3.960	−36.798	1.00	42.18
ATOM	3627	N	PRO	A	478	−32.831	−5.743	−37.780	1.00	43.46
ATOM	3628	CA	PRO	A	478	−34.150	−5.106	−37.669	1.00	44.02
ATOM	3629	CB	PRO	A	478	−35.106	−6.144	−38.267	1.00	43.89
ATOM	3630	CG	PRO	A	478	−34.255	−7.033	−39.105	1.00	44.08
ATOM	3631	CD	PRO	A	478	−32.885	−7.034	−38.493	1.00	43.41
ATOM	3632	C	PRO	A	478	−34.480	−4.892	−36.194	1.00	44.52
ATOM	3633	O	PRO	A	478	−34.197	−5.769	−35.364	1.00	44.73
ATOM	3634	N	GLY	A	479	−35.043	−3.728	−35.874	1.00	45.20
ATOM	3635	CA	GLY	A	479	−35.421	−3.395	−34.494	1.00	45.90
ATOM	3636	C	GLY	A	479	−34.386	−2.601	−33.711	1.00	46.37
ATOM	3637	O	GLY	A	479	−34.576	−2.331	−32.520	1.00	46.98
ATOM	3638	N	VAL	A	480	−33.282	−2.244	−34.367	1.00	46.28
ATOM	3639	CA	VAL	A	480	−32.261	−1.383	−33.760	1.00	46.15
ATOM	3640	CB	VAL	A	480	−30.820	−1.863	−34.121	1.00	46.20
ATOM	3641	CG1	VAL	A	480	−29.755	−0.899	−33.584	1.00	45.85
ATOM	3642	CG2	VAL	A	480	−30.569	−3.281	−33.603	1.00	46.25
ATOM	3643	C	VAL	A	480	−32.498	0.046	−34.260	1.00	45.93
ATOM	3644	O	VAL	A	480	−32.673	0.240	−35.465	1.00	46.15
ATOM	3645	N	PRO	A	481	−32.534	1.049	−33.344	1.00	45.70
ATOM	3646	CA	PRO	A	481	−32.648	2.443	−33.804	1.00	45.36
ATOM	3647	CB	PRO	A	481	−32.388	3.266	−32.542	1.00	45.39
ATOM	3648	CG	PRO	A	481	−32.778	2.375	−31.427	1.00	45.52
ATOM	3649	CD	PRO	A	481	−32.481	0.962	−31.873	1.00	45.83
ATOM	3650	C	PRO	A	481	−31.609	2.762	−34.877	1.00	45.08
ATOM	3651	O	PRO	A	481	−30.405	2.555	−34.681	1.00	44.45
ATOM	3652	N	SER	A	482	−32.100	3.241	−36.011	1.00	44.83
ATOM	3653	CA	SER	A	482	−31.281	3.485	−37.180	1.00	44.52
ATOM	3654	CB	SER	A	482	−31.502	2.375	−38.211	1.00	44.74
ATOM	3655	OG	SER	A	482	−30.769	2.622	−39.399	1.00	45.89
ATOM	3656	C	SER	A	482	−31.661	4.836	−37.765	1.00	43.84
ATOM	3657	O	SER	A	482	−32.836	5.219	−37.741	1.00	44.07
ATOM	3658	N	GLY	A	483	−30.667	5.550	−38.282	1.00	42.68
ATOM	3659	CA	GLY	A	483	−30.872	6.872	−38.853	1.00	41.64
ATOM	3660	C	GLY	A	483	−30.085	7.095	−40.130	1.00	41.05
ATOM	3661	O	GLY	A	483	−29.430	6.179	−40.647	1.00	41.09
ATOM	3662	N	THR	A	484	−30.155	8.317	−40.647	1.00	40.22
ATOM	3663	CA	THR	A	484	−29.461	8.677	−41.888	1.00	39.91
ATOM	3664	CB	THR	A	484	−30.148	9.876	−42.619	1.00	40.21
ATOM	3665	OG1	THR	A	484	−30.115	11.040	−41.780	1.00	41.48
ATOM	3666	CG2	THR	A	484	−31.604	9.541	−43.000	1.00	40.86
ATOM	3667	C	THR	A	484	−27.995	9.033	−41.603	1.00	38.43
ATOM	3668	O	THR	A	484	−27.669	9.421	−40.483	1.00	38.52
ATOM	3669	N	PRO	A	485	−27.109	8.893	−42.612	1.00	37.36
ATOM	3670	CA	PRO	A	485	−25.695	9.226	−42.413	1.00	36.29
ATOM	3671	CB	PRO	A	485	−25.077	8.974	−43.795	1.00	36.75
ATOM	3672	CG	PRO	A	485	−25.997	7.985	−44.442	1.00	37.04
ATOM	3673	CD	PRO	A	485	−27.359	8.393	−43.976	1.00	37.30
ATOM	3674	C	PRO	A	485	−25.460	10.684	−41.988	1.00	35.20
ATOM	3675	O	PRO	A	485	−26.201	11.599	−42.396	1.00	34.39
ATOM	3676	N	TYR	A	486	−24.428	10.887	−41.174	1.00	33.60
ATOM	3677	CA	TYR	A	486	−24.025	12.233	−40.782	1.00	32.74
ATOM	3678	CB	TYR	A	486	−22.821	12.180	−39.826	1.00	32.31

TABLE 15-continued

ATOM	3679	CG	TYR	A	486	−22.348	13.564	−39.452	1.00	32.79
ATOM	3680	CD1	TYR	A	486	−21.243	14.146	−40.083	1.00	31.74
ATOM	3681	CE1	TYR	A	486	−20.827	15.430	−39.742	1.00	30.85
ATOM	3682	CZ	TYR	A	486	−21.527	16.141	−38.778	1.00	31.99
ATOM	3683	OH	TYR	A	486	−21.143	17.423	−38.427	1.00	32.20
ATOM	3684	CE2	TYR	A	486	−22.629	15.588	−38.160	1.00	31.88
ATOM	3685	CD2	TYR	A	486	−23.036	14.311	−38.500	1.00	32.49
ATOM	3686	C	TYR	A	486	−23.652	13.082	−41.999	1.00	31.99
ATOM	3687	O	TYR	A	486	−22.949	12.602	−42.900	1.00	31.62
ATOM	3688	N	THR	A	487	−24.106	14.336	−42.004	1.00	31.14
ATOM	3689	CA	THR	A	487	−23.676	15.336	−42.986	1.00	31.43
ATOM	3690	CB	THR	A	487	−24.879	15.785	−43.869	1.00	31.94
ATOM	3691	OG1	THR	A	487	−25.321	14.665	−44.644	1.00	35.19
ATOM	3692	CG2	THR	A	487	−24.489	16.904	−44.810	1.00	32.95
ATOM	3693	C	THR	A	487	−23.110	16.561	−42.261	1.00	29.79
ATOM	3694	O	THR	A	487	−23.761	17.078	−41.363	1.00	29.20
ATOM	3695	N	PRO	A	488	−21.901	17.027	−42.644	1.00	29.20
ATOM	3696	CA	PRO	A	488	−21.309	18.228	−42.005	1.00	28.77
ATOM	3697	CB	PRO	A	488	−19.988	18.435	−42.763	1.00	28.75
ATOM	3698	CG	PRO	A	488	−19.684	17.126	−43.408	1.00	29.52
ATOM	3699	CD	PRO	A	488	−21.010	16.448	−43.667	1.00	29.41
ATOM	3700	C	PRO	A	488	−22.175	19.463	−42.194	1.00	28.44
ATOM	3701	O	PRO	A	488	−23.003	19.499	−43.116	1.00	28.51
ATOM	3702	N	LEU	A	489	−21.971	20.469	−41.345	1.00	27.28
ATOM	3703	CA	LEU	A	489	−22.606	21.775	−41.522	1.00	26.52
ATOM	3704	CB	LEU	A	489	−22.269	22.708	−40.365	1.00	27.19
ATOM	3705	CG	LEU	A	489	−22.805	22.303	−38.987	1.00	27.53
ATOM	3706	CD1	LEU	A	489	−22.233	23.242	−37.929	1.00	26.81
ATOM	3707	CD2	LEU	A	489	−24.332	22.323	−38.970	1.00	28.98
ATOM	3708	C	LEU	A	489	−22.137	22.402	−42.833	1.00	26.65
ATOM	3709	O	LEU	A	489	−20.983	22.210	−43.245	1.00	25.40
ATOM	3710	N	PRO	A	490	−23.030	23.153	−43.503	1.00	26.84
ATOM	3711	CA	PRO	A	490	−22.636	23.745	−44.786	1.00	26.44
ATOM	3712	CB	PRO	A	490	−23.983	24.107	−45.432	1.00	27.00
ATOM	3713	CG	PRO	A	490	−24.900	24.341	−44.289	1.00	27.68
ATOM	3714	CD	PRO	A	490	−24.425	23.475	−43.137	1.00	26.91
ATOM	3715	C	PRO	A	490	−21.737	24.982	−44.668	1.00	26.22
ATOM	3716	O	PRO	A	490	−21.826	25.729	−43.698	1.00	25.74
ATOM	3717	N	CYS	A	491	−20.858	25.182	−45.650	1.00	26.06
ATOM	3718	CA	CYS	A	491	−20.079	26.412	−45.754	1.00	26.88
ATOM	3719	CB	CYS	A	491	−18.630	26.194	−45.302	1.00	27.00
ATOM	3720	SG	CYS	A	491	−18.450	25.196	−43.819	1.00	27.23
ATOM	3721	C	CYS	A	491	−20.032	26.822	−47.217	1.00	27.27
ATOM	3722	O	CYS	A	491	−20.369	26.026	−48.083	1.00	27.34
ATOM	3723	N	ALA	A	492	−19.577	28.045	−47.484	1.00	28.05
ATOM	3724	CA	ALA	A	492	−19.205	28.449	−48.845	1.00	29.40
ATOM	3725	CB	ALA	A	492	−18.837	29.928	−48.866	1.00	29.49
ATOM	3726	C	ALA	A	492	−18.023	27.599	−49.320	1.00	30.37
ATOM	3727	O	ALA	A	492	−17.310	26.998	−48.497	1.00	30.36
ATOM	3728	N	THR	A	493	−17.828	27.508	−50.633	1.00	31.27
ATOM	3729	CA	THR	A	493	−16.612	26.883	−51.163	1.00	32.43
ATOM	3730	CB	THR	A	493	−16.845	26.234	−52.533	1.00	33.22
ATOM	3731	OG1	THR	A	493	−17.944	25.324	−52.431	1.00	38.55
ATOM	3732	CG2	THR	A	493	−15.590	25.464	−52.996	1.00	33.71
ATOM	3733	C	THR	A	493	−15.596	28.006	−51.254	1.00	31.35
ATOM	3734	O	THR	A	493	−15.916	29.068	−51.795	1.00	31.58
ATOM	3735	N	PRO	A	494	−14.390	27.815	−50.682	1.00	30.44
ATOM	3736	CA	PRO	A	494	−13.464	28.947	−50.696	1.00	30.01
ATOM	3737	CB	PRO	A	494	−12.414	28.555	−49.645	1.00	30.26
ATOM	3738	CG	PRO	A	494	−12.416	27.077	−49.658	1.00	30.56
ATOM	3739	CD	PRO	A	494	−13.815	26.635	−49.997	1.00	30.85
ATOM	3740	C	PRO	A	494	−12.809	29.089	−52.060	1.00	28.81
ATOM	3741	O	PRO	A	494	−12.801	28.137	−52.834	1.00	28.82
ATOM	3742	N	THR	A	495	−12.260	30.258	−52.352	1.00	28.43
ATOM	3743	CA	THR	A	495	−11.551	30.419	−53.623	1.00	28.44
ATOM	3744	CB	THR	A	495	−11.885	31.748	−54.319	1.00	28.68
ATOM	3745	OG1	THR	A	495	−11.449	32.839	−53.500	1.00	30.39
ATOM	3746	CG2	THR	A	495	−13.383	31.858	−54.564	1.00	29.85
ATOM	3747	C	THR	A	495	−10.057	30.335	−53.404	1.00	27.94
ATOM	3748	O	THR	A	495	−9.289	30.159	−54.352	1.00	27.63
ATOM	3749	N	SER	A	496	−9.671	30.463	−52.139	1.00	27.51
ATOM	3750	CA	SER	A	496	−8.279	30.492	−51.722	1.00	27.18
ATOM	3751	CB	SER	A	496	−7.928	31.916	−51.329	1.00	27.72
ATOM	3752	OG	SER	A	496	−6.531	32.076	−51.240	1.00	32.60
ATOM	3753	C	SER	A	496	−8.134	29.583	−50.501	1.00	25.85
ATOM	3754	O	SER	A	496	−9.024	29.548	−49.634	1.00	25.10
ATOM	3755	N	VAL	A	497	−7.039	28.824	−50.430	1.00	24.43
ATOM	3756	CA	VAL	A	497	−6.801	28.032	−49.209	1.00	22.17
ATOM	3757	CB	VAL	A	497	−7.281	26.511	−49.290	1.00	23.00
ATOM	3758	CG1	VAL	A	497	−6.224	25.445	−48.881	1.00	22.48

TABLE 15-continued

ATOM	3759	CG2	VAL	A	497	−8.049	26.161	−50.578	1.00	22.62
ATOM	3760	C	VAL	A	497	−5.388	28.251	−48.672	1.00	21.13
ATOM	3761	O	VAL	A	497	−4.419	28.359	−49.439	1.00	20.38
ATOM	3762	N	ALA	A	498	−5.302	28.395	−47.355	1.00	19.70
ATOM	3763	CA	ALA	A	498	−4.020	28.576	−46.702	1.00	18.92
ATOM	3764	CB	ALA	A	498	−4.226	29.126	−45.290	1.00	19.31
ATOM	3765	C	ALA	A	498	−3.396	27.185	−46.655	1.00	18.67
ATOM	3766	O	ALA	A	498	−3.966	26.266	−46.047	1.00	19.29
ATOM	3767	N	VAL	A	499	−2.252	27.021	−47.319	1.00	17.23
ATOM	3768	CA	VAL	A	499	−1.551	25.735	−47.361	1.00	16.09
ATOM	3769	CB	VAL	A	499	−1.165	25.347	−48.814	1.00	16.97
ATOM	3770	CG1	VAL	A	499	−0.403	23.984	−48.863	1.00	16.08
ATOM	3771	CG2	VAL	A	499	−2.413	25.291	−49.696	1.00	17.03
ATOM	3772	C	VAL	A	499	−0.306	25.841	−46.491	1.00	15.95
ATOM	3773	O	VAL	A	499	0.604	26.607	−46.791	1.00	16.15
ATOM	3774	N	THR	A	500	−0.279	25.085	−45.404	1.00	15.16
ATOM	3775	CA	THR	A	500	0.863	25.116	−44.505	1.00	14.85
ATOM	3776	CB	THR	A	500	0.415	24.916	−43.035	1.00	14.76
ATOM	3777	OG1	THR	A	500	−0.403	26.022	−42.635	1.00	16.00
ATOM	3778	CG2	THR	A	500	1.639	24.856	−42.136	1.00	15.39
ATOM	3779	C	THR	A	500	1.796	23.993	−44.932	1.00	14.99
ATOM	3780	O	THR	A	500	1.480	22.804	−44.792	1.00	14.81
ATOM	3781	N	PHE	A	501	2.941	24.370	−45.481	1.00	14.71
ATOM	3782	CA	PHE	A	501	3.981	23.411	−45.793	1.00	15.64
ATOM	3783	CB	PHE	A	501	4.943	23.964	−46.832	1.00	15.86
ATOM	3784	CG	PHE	A	501	4.289	24.172	−48.168	1.00	18.38
ATOM	3785	CD1	PHE	A	501	3.676	25.388	−48.469	1.00	19.85
ATOM	3786	CE1	PHE	A	501	3.052	25.581	−49.709	1.00	21.58
ATOM	3787	CZ	PHE	A	501	3.015	24.547	−50.642	1.00	19.80
ATOM	3788	CE2	PHE	A	501	3.607	23.324	−50.356	1.00	21.69
ATOM	3789	CD2	PHE	A	501	4.231	23.134	−49.095	1.00	21.96
ATOM	3790	C	PHE	A	501	4.711	23.009	−44.536	1.00	15.81
ATOM	3791	O	PHE	A	501	5.207	23.852	−43.804	1.00	16.78
ATOM	3792	N	HIS	A	502	4.789	21.698	−44.317	1.00	14.85
ATOM	3793	CA	HIS	A	502	5.239	21.175	−43.027	1.00	14.17
ATOM	3794	CB	HIS	A	502	3.987	20.565	−42.356	1.00	14.85
ATOM	3795	CG	HIS	A	502	4.221	19.875	−41.054	1.00	13.69
ATOM	3796	ND1	HIS	A	502	4.819	18.637	−40.966	1.00	12.55
ATOM	3797	CE1	HIS	A	502	4.816	18.241	−39.702	1.00	15.76
ATOM	3798	NE2	HIS	A	502	4.191	19.155	−38.980	1.00	14.42
ATOM	3799	CD2	HIS	A	502	3.797	20.183	−39.804	1.00	14.92
ATOM	3800	C	HIS	A	502	6.317	20.161	−43.412	1.00	14.16
ATOM	3801	O	HIS	A	502	6.013	19.043	−43.824	1.00	13.85
ATOM	3802	N	GLU	A	503	7.577	20.590	−43.352	1.00	13.63
ATOM	3803	CA	GLU	A	503	8.678	19.821	−43.968	1.00	14.46
ATOM	3804	CB	GLU	A	503	9.434	20.712	−44.996	1.00	14.22
ATOM	3805	CG	GLU	A	503	10.782	20.121	−45.524	1.00	16.31
ATOM	3806	CD	GLU	A	503	10.620	18.973	−46.539	1.00	21.32
ATOM	3807	OE1	GLU	A	503	11.523	18.819	−47.393	1.00	21.21
ATOM	3808	OE2	GLU	A	503	9.609	18.230	−46.510	1.00	20.10
ATOM	3809	C	GLU	A	503	9.657	19.322	−42.917	1.00	14.22
ATOM	3810	O	GLU	A	503	10.175	20.121	−42.131	1.00	15.31
ATOM	3811	N	LEU	A	504	9.960	18.027	−42.927	1.00	14.92
ATOM	3812	CA	LEU	A	504	11.026	17.518	−42.052	1.00	15.49
ATOM	3813	CB	LEU	A	504	10.658	16.147	−41.489	1.00	16.33
ATOM	3814	CG	LEU	A	504	9.479	16.178	−40.498	1.00	17.19
ATOM	3815	CD1	LEU	A	504	8.922	14.753	−40.320	1.00	19.08
ATOM	3816	CD2	LEU	A	504	9.953	16.723	−39.198	1.00	17.28
ATOM	3817	C	LEU	A	504	12.318	17.428	−42.846	1.00	16.59
ATOM	3818	O	LEU	A	504	12.403	16.656	−43.785	1.00	16.72
ATOM	3819	N	VAL	A	505	13.317	18.201	−42.444	1.00	17.20
ATOM	3820	CA	VAL	A	505	14.592	18.235	−43.154	1.00	19.16
ATOM	3821	CB	VAL	A	505	14.548	19.141	−44.418	1.00	18.88
ATOM	3822	CG1	VAL	A	505	14.028	20.539	−44.090	1.00	19.28
ATOM	3823	CG2	VAL	A	505	15.948	19.219	−45.095	1.00	21.65
ATOM	3824	C	VAL	A	505	15.674	18.705	−42.188	1.00	20.00
ATOM	3825	O	VAL	A	505	15.595	19.785	−41.595	1.00	19.92
ATOM	3826	N	SER	A	506	16.685	17.868	−42.011	1.00	21.73
ATOM	3827	CA	SER	A	506	17.761	18.216	−41.104	1.00	23.33
ATOM	3828	CB	SER	A	506	18.570	16.974	−40.771	1.00	23.74
ATOM	3829	OG	SER	A	506	19.583	17.320	−39.847	1.00	28.30
ATOM	3830	C	SER	A	506	18.646	19.284	−41.759	1.00	23.03
ATOM	3831	O	SER	A	506	19.070	19.139	−42.908	1.00	23.20
ATOM	3832	N	THR	A	507	18.888	20.371	−41.049	1.00	24.01
ATOM	3833	CA	THR	A	507	19.685	21.464	−41.600	1.00	25.15
ATOM	3834	CB	THR	A	507	18.845	22.725	−41.833	1.00	25.01
ATOM	3835	OG1	THR	A	507	18.104	23.015	−40.650	1.00	24.43
ATOM	3836	CG2	THR	A	507	17.891	22.536	−43.000	1.00	24.71
ATOM	3837	C	THR	A	507	20.795	21.812	−40.623	1.00	27.09
ATOM	3838	O	THR	A	507	20.729	21.448	−39.451	1.00	26.15

TABLE 15-continued

ATOM	3839	N	GLN	A	508	21.798	22.536	−41.113	1.00	29.34
ATOM	3840	CA	GLN	A	508	22.912	22.986	−40.272	1.00	32.54
ATOM	3841	CB	GLN	A	508	24.239	22.542	−40.897	1.00	32.54
ATOM	3842	CG	GLN	A	508	24.369	21.010	−40.972	1.00	34.32
ATOM	3843	CD	GLN	A	508	25.400	20.515	−41.991	1.00	36.23
ATOM	3844	OE1	GLN	A	508	26.283	19.700	−41.660	1.00	41.79
ATOM	3845	NE2	GLN	A	508	25.279	20.977	−43.242	1.00	40.42
ATOM	3846	C	GLN	A	508	22.827	24.502	−40.100	1.00	33.06
ATOM	3847	O	GLN	A	508	22.136	25.178	−40.873	1.00	32.49
ATOM	3848	N	PHE	A	509	23.494	25.037	−39.075	1.00	33.80
ATOM	3849	CA	PHE	A	509	23.432	26.476	−38.782	1.00	35.03
ATOM	3850	CB	PHE	A	509	24.413	26.837	−37.651	1.00	36.75
ATOM	3851	CG	PHE	A	509	24.481	28.315	−37.340	1.00	39.07
ATOM	3852	CD1	PHE	A	509	23.592	28.893	−36.428	1.00	41.58
ATOM	3853	CE1	PHE	A	509	23.642	30.265	−36.140	1.00	42.61
ATOM	3854	CZ	PHE	A	509	24.603	31.073	−36.766	1.00	41.78
ATOM	3855	CE2	PHE	A	509	25.507	30.503	−37.678	1.00	42.48
ATOM	3856	CD2	PHE	A	509	25.441	29.127	−37.955	1.00	41.46
ATOM	3857	C	PHE	A	509	23.712	27.311	−40.040	1.00	34.58
ATOM	3858	O	PHE	A	509	24.614	26.990	−40.815	1.00	34.58
ATOM	3859	N	GLY	A	510	22.912	28.355	−40.256	1.00	33.85
ATOM	3860	CA	GLY	A	510	23.101	29.241	−41.407	1.00	33.22
ATOM	3861	C	GLY	A	510	22.352	28.826	−42.671	1.00	32.36
ATOM	3862	O	GLY	A	510	22.369	29.545	−43.679	1.00	32.97
ATOM	3863	N	GLN	A	511	21.705	27.663	−42.628	1.00	30.50
ATOM	3864	CA	GLN	A	511	20.885	27.217	−43.745	1.00	29.02
ATOM	3865	CB	GLN	A	511	21.026	25.712	−43.931	1.00	28.92
ATOM	3866	CG	GLN	A	511	22.436	25.276	−44.349	1.00	29.91
ATOM	3867	CD	GLN	A	511	22.571	23.776	−44.439	1.00	31.36
ATOM	3868	OE1	GLN	A	511	21.760	23.036	−43.879	1.00	31.69
ATOM	3869	NE2	GLN	A	511	23.590	23.309	−45.160	1.00	30.72
ATOM	3870	C	GLN	A	511	19.418	27.619	−43.543	1.00	27.82
ATOM	3871	O	GLN	A	511	18.928	27.695	−42.399	1.00	27.36
ATOM	3872	N	THR	A	512	18.727	27.895	−44.650	1.00	25.92
ATOM	3873	CA	THR	A	512	17.305	28.271	−44.613	1.00	24.51
ATOM	3874	CB	THR	A	512	17.126	29.763	−44.994	1.00	24.95
ATOM	3875	OG1	THR	A	512	17.769	30.580	−44.004	1.00	27.43
ATOM	3876	CG2	THR	A	512	15.653	30.151	−45.069	1.00	25.94
ATOM	3877	C	THR	A	512	16.536	27.384	−45.600	1.00	23.09
ATOM	3878	O	THR	A	512	16.994	27.152	−46.717	1.00	22.75
ATOM	3879	N	VAL	A	513	15.376	26.877	−45.200	1.00	20.62
ATOM	3880	CA	VAL	A	513	14.593	26.074	−46.136	1.00	19.05
ATOM	3881	CB	VAL	A	513	13.946	24.855	−45.428	1.00	19.18
ATOM	3882	CG1	VAL	A	513	13.041	24.064	−46.397	1.00	18.87
ATOM	3883	CG2	VAL	A	513	15.042	23.938	−44.895	1.00	20.56
ATOM	3884	C	VAL	A	513	13.536	26.979	−46.748	1.00	17.98
ATOM	3885	O	VAL	A	513	12.910	27.768	−46.029	1.00	16.65
ATOM	3886	N	LYS	A	514	13.346	26.857	−48.063	1.00	17.91
ATOM	3887	CA	LYS	A	514	12.279	27.583	−48.757	1.00	18.14
ATOM	3888	CB	LYS	A	514	12.845	28.712	−49.638	1.00	17.66
ATOM	3889	CG	LYS	A	514	13.867	29.576	−48.945	1.00	19.26
ATOM	3890	CD	LYS	A	514	14.197	30.839	−49.765	1.00	21.27
ATOM	3891	CE	LYS	A	514	15.224	31.675	−49.001	1.00	26.06
ATOM	3892	NZ	LYS	A	514	15.461	33.022	−49.626	1.00	28.70
ATOM	3893	C	LYS	A	514	11.494	26.621	−49.625	1.00	18.22
ATOM	3894	O	LYS	A	514	11.949	25.502	−49.912	1.00	18.39
ATOM	3895	N	VAL	A	515	10.304	27.037	−50.045	1.00	18.20
ATOM	3896	CA	VAL	A	515	9.546	26.212	−50.980	1.00	19.00
ATOM	3897	CB	VAL	A	515	8.198	25.731	−50.404	1.00	20.00
ATOM	3898	CG1	VAL	A	515	7.403	26.904	−49.879	1.00	21.01
ATOM	3899	CG2	VAL	A	515	7.417	24.903	−51.447	1.00	20.10
ATOM	3900	C	VAL	A	515	9.421	26.973	−52.302	1.00	18.89
ATOM	3901	O	VAL	A	515	9.079	28.159	−52.317	1.00	18.67
ATOM	3902	N	ALA	A	516	9.781	26.295	−53.390	1.00	19.87
ATOM	3903	CA	ALA	A	516	9.796	26.898	−54.732	1.00	20.38
ATOM	3904	CB	ALA	A	516	11.177	26.768	−55.356	1.00	20.58
ATOM	3905	C	ALA	A	516	8.789	26.110	−55.525	1.00	20.65
ATOM	3906	O	ALA	A	516	8.638	24.910	−55.303	1.00	20.40
ATOM	3907	N	GLY	A	517	8.075	26.765	−56.430	1.00	20.80
ATOM	3908	CA	GLY	A	517	7.092	26.039	−57.214	1.00	22.32
ATOM	3909	C	GLY	A	517	6.536	26.853	−58.352	1.00	22.86
ATOM	3910	O	GLY	A	517	6.902	28.024	−58.527	1.00	22.58
ATOM	3911	N	ASN	A	518	5.642	26.233	−59.116	1.00	24.66
ATOM	3912	CA	ASN	A	518	5.201	26.817	−60.390	1.00	26.74
ATOM	3913	CB	ASN	A	518	4.670	25.754	−61.354	1.00	26.97
ATOM	3914	CG	ASN	A	518	3.386	25.117	−60.872	1.00	31.69
ATOM	3915	OD1	ASN	A	518	3.004	25.226	−59.677	1.00	28.89
ATOM	3916	ND2	ASN	A	518	2.707	24.419	−61.786	1.00	31.65
ATOM	3917	C	ASN	A	518	4.199	27.937	−60.232	1.00	27.20
ATOM	3918	O	ASN	A	518	4.154	28.822	−61.079	1.00	28.68

TABLE 15-continued

ATOM	3919	N	ALA	A	519	3.399	27.907	−59.163	1.00	27.04
ATOM	3920	CA	ALA	A	519	2.424	28.978	−58.898	1.00	26.47
ATOM	3921	CB	ALA	A	519	1.473	28.598	−57.747	1.00	27.02
ATOM	3922	C	ALA	A	519	3.090	30.322	−58.629	1.00	26.35
ATOM	3923	O	ALA	A	519	4.226	30.394	−58.135	1.00	25.27
ATOM	3924	N	ALA	A	520	2.369	31.394	−58.954	1.00	26.25
ATOM	3925	CA	ALA	A	520	2.887	32.741	−58.784	1.00	26.77
ATOM	3926	CB	ALA	A	520	1.872	33.775	−59.298	1.00	27.50
ATOM	3927	C	ALA	A	520	3.250	33.004	−57.317	1.00	26.68
ATOM	3928	O	ALA	A	520	4.301	33.560	−57.030	1.00	26.01
ATOM	3929	N	ALA	A	521	2.395	32.548	−56.399	1.00	26.75
ATOM	3930	CA	ALA	A	521	2.628	32.712	−54.963	1.00	26.82
ATOM	3931	CB	ALA	A	521	1.395	32.251	−54.167	1.00	26.85
ATOM	3932	C	ALA	A	521	3.876	31.950	−54.504	1.00	26.51
ATOM	3933	O	ALA	A	521	4.485	32.305	−53.494	1.00	26.63
ATOM	3934	N	LEU	A	522	4.261	30.919	−55.259	1.00	26.79
ATOM	3935	CA	LEU	A	522	5.452	30.113	−54.932	1.00	26.50
ATOM	3936	CB	LEU	A	522	5.185	28.626	−55.155	1.00	26.64
ATOM	3937	CG	LEU	A	522	4.224	27.946	−54.169	1.00	26.58
ATOM	3938	CD1	LEU	A	522	4.049	26.489	−54.533	1.00	27.59
ATOM	3939	CD2	LEU	A	522	4.718	28.092	−52.730	1.00	28.08
ATOM	3940	C	LEU	A	522	6.696	30.559	−55.709	1.00	26.54
ATOM	3941	O	LEU	A	522	7.779	29.987	−55.547	1.00	25.56
ATOM	3942	N	GLY	A	523	6.518	31.575	−56.552	1.00	26.25
ATOM	3943	CA	GLY	A	523	7.637	32.267	−57.199	1.00	26.16
ATOM	3944	C	GLY	A	523	7.996	31.809	−58.607	1.00	26.84
ATOM	3945	O	GLY	A	523	9.029	32.227	−59.152	1.00	25.81
ATOM	3946	N	ASN	A	524	7.162	30.946	−59.193	1.00	27.13
ATOM	3947	CA	ASN	A	524	7.413	30.419	−60.539	1.00	27.74
ATOM	3948	CB	ASN	A	524	7.046	31.484	−61.591	1.00	28.43
ATOM	3949	CG	ASN	A	524	7.123	30.960	−63.015	1.00	30.79
ATOM	3950	OD1	ASN	A	524	6.856	29.780	−63.285	1.00	30.80
ATOM	3951	ND2	ASN	A	524	7.515	31.838	−63.936	1.00	33.61
ATOM	3952	C	ASN	A	524	8.845	29.857	−60.710	1.00	28.44
ATOM	3953	O	ASN	A	524	9.531	30.104	−61.720	1.00	27.82
ATOM	3954	N	TRP	A	525	9.280	29.111	−59.693	1.00	27.99
ATOM	3955	CA	TRP	A	525	10.573	28.398	−59.659	1.00	28.92
ATOM	3956	CB	TRP	A	525	10.787	27.507	−60.896	1.00	28.31
ATOM	3957	CG	TRP	A	525	9.803	26.394	−61.060	1.00	27.68
ATOM	3958	CD1	TRP	A	525	8.902	26.247	−62.078	1.00	27.96
ATOM	3959	NE1	TRP	A	525	8.166	25.106	−61.907	1.00	27.55
ATOM	3960	CE2	TRP	A	525	8.589	24.471	−60.762	1.00	30.58
ATOM	3961	CD2	TRP	A	525	9.609	25.277	−60.184	1.00	27.84
ATOM	3962	CE3	TRP	A	525	10.230	24.842	−59.001	1.00	26.50
ATOM	3963	CZ3	TRP	A	525	9.787	23.655	−58.411	1.00	27.55
ATOM	3964	CH2	TRP	A	525	8.752	22.889	−58.998	1.00	27.90
ATOM	3965	CZ2	TRP	A	525	8.144	23.279	−60.168	1.00	26.22
ATOM	3966	C	TRP	A	525	11.790	29.301	−59.452	1.00	29.66
ATOM	3967	O	TRP	A	525	12.921	28.804	−59.346	1.00	30.61
ATOM	3968	N	SER	A	526	11.570	30.613	−59.380	1.00	30.33
ATOM	3969	CA	SER	A	526	12.645	31.536	−59.004	1.00	31.13
ATOM	3970	CB	SER	A	526	12.213	32.993	−59.187	1.00	31.02
ATOM	3971	OG	SER	A	526	13.166	33.838	−58.562	1.00	33.69
ATOM	3972	C	SER	A	526	13.086	31.312	−57.560	1.00	31.29
ATOM	3973	O	SER	A	526	12.271	31.381	−56.627	1.00	31.21
ATOM	3974	N	THR	A	527	14.373	31.049	−57.367	1.00	31.34
ATOM	3975	CA	THR	A	527	14.880	30.794	−56.021	1.00	31.64
ATOM	3976	CB	THR	A	527	16.259	30.098	−56.024	1.00	31.79
ATOM	3977	OG1	THR	A	527	17.217	30.931	−56.682	1.00	31.43
ATOM	3978	CG2	THR	A	527	16.169	28.739	−56.724	1.00	32.27
ATOM	3979	C	THR	A	527	14.911	32.045	−55.152	1.00	31.99
ATOM	3980	O	THR	A	527	14.847	31.959	−53.922	1.00	32.36
ATOM	3981	N	SER	A	528	14.986	33.209	−55.787	1.00	31.79
ATOM	3982	CA	SER	A	528	14.928	34.463	−55.054	1.00	32.02
ATOM	3983	CB	SER	A	528	15.517	35.615	−55.885	1.00	32.70
ATOM	3984	OG	SER	A	528	14.712	35.882	−57.031	1.00	34.94
ATOM	3985	C	SER	A	528	13.497	34.784	−54.579	1.00	31.23
ATOM	3986	O	SER	A	528	13.330	35.435	−53.550	1.00	32.02
ATOM	3987	N	ALA	A	529	12.479	34.314	−55.306	1.00	29.33
ATOM	3988	CA	ALA	A	529	11.093	34.506	−54.893	1.00	27.60
ATOM	3989	CB	ALA	A	529	10.211	34.864	−56.086	1.00	27.34
ATOM	3990	C	ALA	A	529	10.482	33.328	−54.112	1.00	26.40
ATOM	3991	O	ALA	A	529	9.311	33.382	−53.754	1.00	26.54
ATOM	3992	N	ALA	A	530	11.268	32.286	−53.842	1.00	25.12
ATOM	3993	CA	ALA	A	530	10.777	31.114	−53.096	1.00	24.19
ATOM	3994	CB	ALA	A	530	11.855	30.063	−52.991	1.00	23.88
ATOM	3995	C	ALA	A	530	10.336	31.555	−51.706	1.00	23.55
ATOM	3996	O	ALA	A	530	10.848	32.540	−51.182	1.00	23.61
ATOM	3997	N	VAL	A	531	9.396	30.833	−51.110	1.00	22.18
ATOM	3998	CA	VAL	A	531	8.851	31.248	−49.821	1.00	22.62

TABLE 15-continued

ATOM	3999	CB	VAL	A	531	7.380	30.821	−49.677	1.00	22.81
ATOM	4000	CG1	VAL	A	531	6.815	31.335	−48.346	1.00	25.06
ATOM	4001	CG2	VAL	A	531	6.551	31.353	−50.886	1.00	25.38
ATOM	4002	C	VAL	A	531	9.659	30.646	−48.674	1.00	21.29
ATOM	4003	O	VAL	A	531	9.768	29.425	−48.564	1.00	20.72
ATOM	4004	N	ALA	A	532	10.215	31.493	−47.819	1.00	20.86
ATOM	4005	CA	ALA	A	532	11.008	30.999	−46.698	1.00	20.26
ATOM	4006	CB	ALA	A	532	11.850	32.128	−46.084	1.00	21.02
ATOM	4007	C	ALA	A	532	10.093	30.356	−45.646	1.00	20.51
ATOM	4008	O	ALA	A	532	9.019	30.884	−45.337	1.00	20.05
ATOM	4009	N	LEU	A	533	10.514	29.200	−45.129	1.00	19.00
ATOM	4010	CA	LEU	A	533	9.855	28.565	−43.999	1.00	18.65
ATOM	4011	CB	LEU	A	533	9.901	27.029	−44.148	1.00	18.14
ATOM	4012	CG	LEU	A	533	9.395	26.450	−45.483	1.00	19.25
ATOM	4013	CD1	LEU	A	533	9.385	24.923	−45.427	1.00	21.28
ATOM	4014	CD2	LEU	A	533	8.030	26.980	−45.894	1.00	18.58
ATOM	4015	C	LEU	A	533	10.541	29.014	−42.702	1.00	18.95
ATOM	4016	O	LEU	A	533	11.622	29.648	−42.744	1.00	18.94
ATOM	4017	N	ASP	A	534	9.905	28.715	−41.570	1.00	18.56
ATOM	4018	CA	ASP	A	534	10.381	29.096	−40.238	1.00	18.36
ATOM	4019	CB	ASP	A	534	9.220	29.634	−39.374	1.00	19.76
ATOM	4020	CG	ASP	A	534	8.757	30.992	−39.798	1.00	23.55
ATOM	4021	OD1	ASP	A	534	7.548	31.264	−39.659	1.00	26.14
ATOM	4022	OD2	ASP	A	534	9.600	31.774	−40.283	1.00	27.39
ATOM	4023	C	ASP	A	534	10.877	27.867	−39.504	1.00	17.68
ATOM	4024	O	ASP	A	534	10.310	26.780	−39.667	1.00	16.10
ATOM	4025	N	ALA	A	535	11.883	28.057	−38.654	1.00	17.05
ATOM	4026	CA	ALA	A	535	12.405	26.950	−37.835	1.00	17.76
ATOM	4027	CB	ALA	A	535	13.926	26.952	−37.832	1.00	17.96
ATOM	4028	C	ALA	A	535	11.872	27.027	−36.403	1.00	17.82
ATOM	4029	O	ALA	A	535	12.482	26.490	−35.474	1.00	18.36
ATOM	4030	N	VAL	A	536	10.745	27.706	−36.225	1.00	17.68
ATOM	4031	CA	VAL	A	536	10.138	27.861	−34.898	1.00	18.65
ATOM	4032	CB	VAL	A	536	8.824	28.719	−34.975	1.00	18.66
ATOM	4033	CG1	VAL	A	536	7.805	28.123	−35.971	1.00	19.98
ATOM	4034	CG2	VAL	A	536	8.208	28.962	−33.570	1.00	20.19
ATOM	4035	C	VAL	A	536	9.938	26.514	−34.155	1.00	18.51
ATOM	4036	O	VAL	A	536	10.124	26.437	−32.923	1.00	19.61
ATOM	4037	N	ASN	A	537	9.570	25.468	−34.883	1.00	18.59
ATOM	4038	CA	ASN	A	537	9.344	24.154	−34.261	1.00	19.07
ATOM	4039	CB	ASN	A	537	8.074	23.498	−34.816	1.00	19.28
ATOM	4040	CG	ASN	A	537	6.800	24.252	−34.448	1.00	21.02
ATOM	4041	OD1	ASN	A	537	6.742	24.940	−33.435	1.00	24.12
ATOM	4042	ND2	ASN	A	537	5.762	24.089	−35.265	1.00	20.99
ATOM	4043	C	ASN	A	537	10.518	23.182	−34.445	1.00	19.15
ATOM	4044	O	ASN	A	537	10.394	21.971	−34.196	1.00	18.60
ATOM	4045	N	TYR	A	538	11.653	23.699	−34.897	1.00	19.05
ATOM	4046	CA	TYR	A	538	12.767	22.830	−35.234	1.00	20.32
ATOM	4047	CB	TYR	A	538	13.816	23.618	−36.026	1.00	20.37
ATOM	4048	CG	TYR	A	538	14.916	22.747	−36.588	1.00	20.37
ATOM	4049	CD1	TYR	A	538	14.822	22.238	−37.886	1.00	20.39
ATOM	4050	CE1	TYR	A	538	15.853	21.436	−38.437	1.00	20.49
ATOM	4051	CZ	TYR	A	538	16.961	21.137	−37.670	1.00	20.65
ATOM	4052	OH	TYR	A	538	17.946	20.341	−38.218	1.00	21.53
ATOM	4053	CE2	TYR	A	538	17.066	21.602	−36.361	1.00	22.05
ATOM	4054	CD2	TYR	A	538	16.043	22.418	−35.825	1.00	21.95
ATOM	4055	C	TYR	A	538	13.436	22.209	−33.981	1.00	21.29
ATOM	4056	O	TYR	A	538	13.733	22.919	−33.036	1.00	21.89
ATOM	4057	N	ALA	A	539	13.695	20.902	−34.014	1.00	22.15
ATOM	4058	CA	ALA	A	539	14.646	20.258	−33.083	1.00	23.67
ATOM	4059	CB	ALA	A	539	13.909	19.536	−31.976	1.00	23.94
ATOM	4060	C	ALA	A	539	15.545	19.289	−33.849	1.00	24.35
ATOM	4061	O	ALA	A	539	15.117	18.698	−34.833	1.00	23.63
ATOM	4062	N	ASP	A	540	16.793	19.118	−33.405	1.00	25.69
ATOM	4063	CA	ASP	A	540	17.722	18.196	−34.099	1.00	27.42
ATOM	4064	CB	ASP	A	540	19.044	18.051	−33.339	1.00	28.62
ATOM	4065	CG	ASP	A	540	19.724	19.368	−33.140	1.00	33.80
ATOM	4066	OD1	ASP	A	540	19.875	20.115	−34.147	1.00	36.83
ATOM	4067	OD2	ASP	A	540	20.080	19.663	−31.970	1.00	40.32
ATOM	4068	C	ASP	A	540	17.150	16.818	−34.400	1.00	26.63
ATOM	4069	O	ASP	A	540	17.386	16.277	−35.485	1.00	27.28
ATOM	4070	N	ASN	A	541	16.403	16.247	−33.458	1.00	25.08
ATOM	4071	CA	ASN	A	541	15.827	14.922	−33.687	1.00	24.03
ATOM	4072	CB	ASN	A	541	15.988	14.032	−32.441	1.00	25.14
ATOM	4073	CG	ASN	A	541	15.337	14.623	−31.191	1.00	27.81
ATOM	4074	OD1	ASN	A	541	15.366	14.001	−30.118	1.00	31.57
ATOM	4075	ND2	ASN	A	541	14.771	15.824	−31.306	1.00	28.81
ATOM	4076	C	ASN	A	541	14.349	14.991	−34.118	1.00	22.46
ATOM	4077	O	ASN	A	541	13.660	13.979	−34.172	1.00	22.35
ATOM	4078	N	HIS	A	542	13.871	16.197	−34.403	1.00	19.85

TABLE 15-continued

ATOM	4079	CA	HIS	A	542	12.580	16.354	−35.083	1.00	18.22
ATOM	4080	CB	HIS	A	542	11.426	16.392	−34.062	1.00	16.89
ATOM	4081	CG	HIS	A	542	10.071	16.341	−34.699	1.00	17.32
ATOM	4082	ND1	HIS	A	542	9.211	17.417	−34.711	1.00	16.28
ATOM	4083	CE1	HIS	A	542	8.111	17.088	−35.371	1.00	14.64
ATOM	4084	NE2	HIS	A	542	8.217	15.834	−35.765	1.00	15.41
ATOM	4085	CD2	HIS	A	542	9.435	15.340	−35.358	1.00	15.14
ATOM	4086	C	HIS	A	542	12.662	17.650	−35.902	1.00	17.48
ATOM	4087	O	HIS	A	542	12.198	18.698	−35.446	1.00	17.79
ATOM	4088	N	PRO	A	543	13.324	17.584	−37.083	1.00	17.00
ATOM	4089	CA	PRO	A	543	13.797	18.752	−37.832	1.00	17.09
ATOM	4090	CB	PRO	A	543	14.948	18.164	−38.677	1.00	16.57
ATOM	4091	CG	PRO	A	543	14.472	16.759	−38.994	1.00	18.22
ATOM	4092	CD	PRO	A	543	13.676	16.321	−37.764	1.00	17.39
ATOM	4093	C	PRO	A	543	12.718	19.435	−38.691	1.00	16.46
ATOM	4094	O	PRO	A	543	12.811	19.497	−39.922	1.00	17.09
ATOM	4095	N	LEU	A	544	11.726	19.987	−38.009	1.00	15.36
ATOM	4096	CA	LEU	A	544	10.534	20.535	−38.636	1.00	15.10
ATOM	4097	CB	LEU	A	544	9.341	20.376	−37.672	1.00	15.29
ATOM	4098	CG	LEU	A	544	7.968	20.927	−38.134	1.00	16.53
ATOM	4099	CD1	LEU	A	544	7.524	20.364	−39.494	1.00	15.92
ATOM	4100	CD2	LEU	A	544	6.900	20.700	−37.062	1.00	14.59
ATOM	4101	C	LEU	A	544	10.694	22.018	−39.025	1.00	15.09
ATOM	4102	O	LEU	A	544	11.037	22.851	−38.197	1.00	15.34
ATOM	4103	N	TRP	A	545	10.456	22.298	−40.303	1.00	15.03
ATOM	4104	CA	TRP	A	545	10.327	23.637	−40.843	1.00	15.36
ATOM	4105	CB	TRP	A	545	11.288	23.790	−42.023	1.00	15.40
ATOM	4106	CG	TRP	A	545	12.758	23.921	−41.663	1.00	15.62
ATOM	4107	CD1	TRP	A	545	13.653	22.903	−41.384	1.00	16.85
ATOM	4108	NE1	TRP	A	545	14.906	23.437	−41.129	1.00	18.69
ATOM	4109	CE2	TRP	A	545	14.837	24.803	−41.246	1.00	17.78
ATOM	4110	CD2	TRP	A	545	13.498	25.140	−41.584	1.00	17.01
ATOM	4111	CE3	TRP	A	545	13.163	26.488	−41.777	1.00	17.17
ATOM	4112	CZ3	TRP	A	545	14.165	27.456	−41.637	1.00	18.29
ATOM	4113	CH2	TRP	A	545	15.483	27.085	−41.295	1.00	17.22
ATOM	4114	CZ2	TRP	A	545	15.835	25.767	−41.111	1.00	19.09
ATOM	4115	C	TRP	A	545	8.907	23.832	−41.359	1.00	15.14
ATOM	4116	O	TRP	A	545	8.327	22.933	−41.986	1.00	14.45
ATOM	4117	N	ILE	A	546	8.362	25.025	−41.149	1.00	15.19
ATOM	4118	CA	ILE	A	546	6.938	25.244	−41.428	1.00	16.51
ATOM	4119	CB	ILE	A	546	6.107	24.988	−40.130	1.00	17.39
ATOM	4120	CG1	ILE	A	546	4.615	24.852	−40.420	1.00	20.44
ATOM	4121	CD1	ILE	A	546	3.882	23.992	−39.392	1.00	23.59
ATOM	4122	CG2	ILE	A	546	6.391	26.064	−39.050	1.00	17.70
ATOM	4123	C	ILE	A	546	6.674	26.635	−42.006	1.00	16.75
ATOM	4124	O	ILE	A	546	7.352	27.593	−41.647	1.00	15.81
ATOM	4125	N	ALA	A	547	5.716	26.743	−42.925	1.00	16.88
ATOM	4126	CA	ALA	A	547	5.197	28.057	−43.279	1.00	17.94
ATOM	4127	CB	ALA	A	547	6.222	28.893	−43.931	1.00	21.49
ATOM	4128	C	ALA	A	547	4.009	27.919	−44.167	1.00	18.29
ATOM	4129	O	ALA	A	547	3.727	26.828	−44.655	1.00	18.52
ATOM	4130	N	THR	A	548	3.316	29.031	−44.362	1.00	17.99
ATOM	4131	CA	THR	A	548	1.970	29.017	−44.919	1.00	18.72
ATOM	4132	CB	THR	A	548	0.929	29.419	−43.855	1.00	18.65
ATOM	4133	OG1	THR	A	548	1.000	28.500	−42.751	1.00	19.46
ATOM	4134	CG2	THR	A	548	−0.491	29.379	−44.438	1.00	18.79
ATOM	4135	C	THR	A	548	1.865	29.960	−46.104	1.00	19.60
ATOM	4136	O	THR	A	548	2.347	31.090	−46.040	1.00	19.83
ATOM	4137	N	VAL	A	549	1.227	29.485	−47.164	1.00	20.41
ATOM	4138	CA	VAL	A	549	1.048	30.280	−48.389	1.00	22.36
ATOM	4139	CB	VAL	A	549	1.944	29.722	−49.537	1.00	22.77
ATOM	4140	CG1	VAL	A	549	1.717	30.491	−50.845	1.00	25.80
ATOM	4141	CG2	VAL	A	549	3.429	29.781	−49.148	1.00	24.78
ATOM	4142	C	VAL	A	549	−0.399	30.119	−48.800	1.00	22.21
ATOM	4143	O	VAL	A	549	−0.943	29.018	−48.719	1.00	21.56
ATOM	4144	N	ASN	A	550	−1.028	31.211	−49.240	1.00	22.80
ATOM	4145	CA	ASN	A	550	−2.356	31.107	−49.831	1.00	23.95
ATOM	4146	CB	ASN	A	550	−3.114	32.411	−49.649	1.00	24.39
ATOM	4147	CG	ASN	A	550	−3.367	32.706	−48.201	1.00	27.42
ATOM	4148	OD1	ASN	A	550	−3.811	31.838	−47.462	1.00	28.69
ATOM	4149	ND2	ASN	A	550	−3.041	33.911	−47.771	1.00	31.89
ATOM	4150	C	ASN	A	550	−2.278	30.733	−51.294	1.00	23.98
ATOM	4151	O	ASN	A	550	−1.598	31.400	−52.065	1.00	24.73
ATOM	4152	N	LEU	A	551	−2.973	29.667	−51.662	1.00	24.24
ATOM	4153	CA	LEU	A	551	−3.016	29.180	−53.020	1.00	24.78
ATOM	4154	CB	LEU	A	551	−2.348	27.797	−53.135	1.00	25.00
ATOM	4155	CG	LEU	A	551	−0.858	27.721	−52.787	1.00	25.19
ATOM	4156	CD1	LEU	A	551	−0.356	26.284	−52.803	1.00	27.45
ATOM	4157	CD2	LEU	A	551	−0.018	28.613	−53.718	1.00	26.73
ATOM	4158	C	LEU	A	551	−4.471	29.104	−53.488	1.00	25.46

TABLE 15-continued

ATOM	4159	O	LEU	A	551	−5.393	29.018	−52.675	1.00	24.27
ATOM	4160	N	GLU	A	552	−4.661	29.148	−54.804	1.00	26.15
ATOM	4161	CA	GLU	A	552	−6.004	29.165	−55.366	1.00	28.20
ATOM	4162	CB	GLU	A	552	−5.955	29.639	−56.823	1.00	28.30
ATOM	4163	CG	GLU	A	552	−7.326	29.739	−57.494	1.00	32.28
ATOM	4164	CD	GLU	A	552	−7.250	30.281	−58.926	1.00	33.44
ATOM	4165	OE1	GLU	A	552	−8.110	31.126	−59.274	1.00	41.80
ATOM	4166	OE2	GLU	A	552	−6.340	29.873	−59.695	1.00	39.14
ATOM	4167	C	GLU	A	552	−6.610	27.768	−55.253	1.00	26.97
ATOM	4168	O	GLU	A	552	−5.979	26.783	−55.622	1.00	26.49
ATOM	4169	N	ALA	A	553	−7.822	27.684	−54.723	1.00	27.21
ATOM	4170	CA	ALA	A	553	−8.502	26.399	−54.603	1.00	27.89
ATOM	4171	CB	ALA	A	553	−9.876	26.574	−53.953	1.00	28.37
ATOM	4172	C	ALA	A	553	−8.637	25.773	−55.979	1.00	28.57
ATOM	4173	O	ALA	A	553	−8.900	26.477	−56.952	1.00	28.83
ATOM	4174	N	GLY	A	554	−8.438	24.465	−56.064	1.00	28.44
ATOM	4175	CA	GLY	A	554	−8.556	23.753	−57.330	1.00	29.66
ATOM	4176	C	GLY	A	554	−7.274	23.693	−58.145	1.00	30.04
ATOM	4177	O	GLY	A	554	−7.122	22.814	−59.000	1.00	30.33
ATOM	4178	N	ASP	A	555	−6.347	24.606	−57.869	1.00	30.23
ATOM	4179	CA	ASP	A	555	−5.098	24.716	−58.630	1.00	30.61
ATOM	4180	CB	ASP	A	555	−4.313	25.939	−58.161	1.00	30.85
ATOM	4181	CG	ASP	A	555	−3.382	26.503	−59.236	1.00	34.49
ATOM	4182	OD1	ASP	A	555	−3.441	26.053	−60.407	1.00	37.19
ATOM	4183	OD2	ASP	A	555	−2.572	27.408	−58.901	1.00	36.59
ATOM	4184	C	ASP	A	555	−4.238	23.467	−58.486	1.00	30.14
ATOM	4185	O	ASP	A	555	−4.156	22.882	−57.419	1.00	30.07
ATOM	4186	N	VAL	A	556	−3.602	23.046	−59.572	1.00	29.55
ATOM	4187	CA	VAL	A	556	−2.628	21.963	−59.492	1.00	28.74
ATOM	4188	CB	VAL	A	556	−2.732	20.987	−60.680	1.00	29.35
ATOM	4189	CG1	VAL	A	556	−1.666	19.877	−60.569	1.00	28.99
ATOM	4190	CG2	VAL	A	556	−4.125	20.365	−60.720	1.00	30.44
ATOM	4191	C	VAL	A	556	−1.261	22.623	−59.448	1.00	28.04
ATOM	4192	O	VAL	A	556	−0.869	23.336	−60.384	1.00	27.25
ATOM	4193	N	VAL	A	557	−0.544	22.389	−58.352	1.00	26.81
ATOM	4194	CA	VAL	A	557	0.739	23.040	−58.100	1.00	26.14
ATOM	4195	CB	VAL	A	557	0.690	23.859	−56.759	1.00	26.71
ATOM	4196	CG1	VAL	A	557	2.073	24.140	−56.219	1.00	27.82
ATOM	4197	CG2	VAL	A	557	−0.088	25.175	−56.952	1.00	27.34
ATOM	4198	C	VAL	A	557	1.856	21.999	−58.092	1.00	25.64
ATOM	4199	O	VAL	A	557	1.646	20.845	−57.693	1.00	25.24
ATOM	4200	N	GLU	A	558	3.035	22.409	−58.553	1.00	24.16
ATOM	4201	CA	GLU	A	558	4.223	21.579	−58.516	1.00	24.38
ATOM	4202	CB	GLU	A	558	4.737	21.296	−59.933	1.00	24.86
ATOM	4203	CG	GLU	A	558	4.064	20.108	−60.606	1.00	26.34
ATOM	4204	CD	GLU	A	558	4.670	19.790	−61.962	1.00	27.68
ATOM	4205	OE1	GLU	A	558	5.917	19.684	−62.065	1.00	30.56
ATOM	4206	OE2	GLU	A	558	3.883	19.638	−62.915	1.00	32.45
ATOM	4207	C	GLU	A	558	5.262	22.337	−57.730	1.00	22.54
ATOM	4208	O	GLU	A	558	5.389	23.550	−57.883	1.00	22.93
ATOM	4209	N	TYR	A	559	5.992	21.640	−56.867	1.00	21.45
ATOM	4210	CA	TYR	A	559	6.927	22.346	−55.995	1.00	19.96
ATOM	4211	CB	TYR	A	559	6.188	22.972	−54.784	1.00	19.42
ATOM	4212	CG	TYR	A	559	5.624	21.952	−53.796	1.00	18.65
ATOM	4213	CD1	TYR	A	559	6.383	21.524	−52.703	1.00	18.64
ATOM	4214	CE1	TYR	A	559	5.887	20.595	−51.794	1.00	19.09
ATOM	4215	CZ	TYR	A	559	4.614	20.090	−51.955	1.00	18.58
ATOM	4216	OH	TYR	A	559	4.135	19.160	−51.056	1.00	20.55
ATOM	4217	CE2	TYR	A	559	3.819	20.493	−53.024	1.00	18.22
ATOM	4218	CD2	TYR	A	559	4.335	21.438	−53.946	1.00	18.82
ATOM	4219	C	TYR	A	559	8.066	21.445	−55.541	1.00	20.13
ATOM	4220	O	TYR	A	559	8.008	20.215	−55.679	1.00	20.26
ATOM	4221	N	LYS	A	560	9.098	22.079	−54.995	1.00	19.51
ATOM	4222	CA	LYS	A	560	10.208	21.379	−54.349	1.00	19.72
ATOM	4223	CB	LYS	A	560	11.410	21.175	−55.282	1.00	19.66
ATOM	4224	CG	LYS	A	560	11.390	19.870	−56.058	1.00	22.20
ATOM	4225	CD	LYS	A	560	12.767	19.633	−56.714	1.00	24.46
ATOM	4226	CE	LYS	A	560	12.781	18.341	−57.531	1.00	26.96
ATOM	4227	NZ	LYS	A	560	14.189	18.050	−57.980	1.00	26.97
ATOM	4228	C	LYS	A	560	10.680	22.257	−53.234	1.00	18.68
ATOM	4229	O	LYS	A	560	10.583	23.484	−53.318	1.00	19.68
ATOM	4230	N	TYR	A	561	11.240	21.640	−52.206	1.00	17.87
ATOM	4231	CA	TYR	A	561	11.927	22.420	−51.187	1.00	17.82
ATOM	4232	CB	TYR	A	561	11.921	21.690	−49.840	1.00	17.42
ATOM	4233	CG	TYR	A	561	10.518	21.449	−49.346	1.00	16.12
ATOM	4234	CD1	TYR	A	561	9.831	20.276	−49.661	1.00	15.94
ATOM	4235	CE1	TYR	A	561	8.511	20.062	−49.199	1.00	15.79
ATOM	4236	CZ	TYR	A	561	7.897	21.050	−48.456	1.00	15.89
ATOM	4237	OH	TYR	A	561	6.614	20.889	−47.981	1.00	17.17
ATOM	4238	CE2	TYR	A	561	8.557	22.224	−48.164	1.00	16.19

TABLE 15-continued

ATOM	4239	CD2	TYR	A	561	9.856	22.430	−48.625	1.00	17.57
ATOM	4240	C	TYR	A	561	13.360	22.650	−51.607	1.00	18.63
ATOM	4241	O	TYR	A	561	13.963	21.786	−52.265	1.00	18.40
ATOM	4242	N	ILE	A	562	13.904	23.792	−51.201	1.00	18.56
ATOM	4243	CA	ILE	A	562	15.322	24.085	−51.434	1.00	20.18
ATOM	4244	CB	ILE	A	562	15.524	25.247	−52.419	1.00	19.65
ATOM	4245	CG1	ILE	A	562	14.837	26.520	−51.896	1.00	21.64
ATOM	4246	CD1	ILE	A	562	15.074	27.789	−52.741	1.00	21.24
ATOM	4247	CG2	ILE	A	562	15.017	24.829	−53.797	1.00	20.44
ATOM	4248	C	ILE	A	562	15.971	24.446	−50.128	1.00	20.56
ATOM	4249	O	ILE	A	562	15.316	24.956	−49.229	1.00	19.84
ATOM	4250	N	ASN	A	563	17.254	24.134	−50.029	1.00	21.41
ATOM	4251	CA	ASN	A	563	18.076	24.467	−48.886	1.00	22.99
ATOM	4252	CB	ASN	A	563	18.833	23.209	−48.435	1.00	22.69
ATOM	4253	CG	ASN	A	563	19.629	23.433	−47.156	1.00	25.48
ATOM	4254	OD1	ASN	A	563	20.203	24.492	−46.965	1.00	28.81
ATOM	4255	ND2	ASN	A	563	19.669	22.436	−46.285	1.00	25.82
ATOM	4256	C	ASN	A	563	19.039	25.561	−49.372	1.00	24.66
ATOM	4257	O	ASN	A	563	19.794	25.326	−50.323	1.00	24.16
ATOM	4258	N	VAL	A	564	18.977	26.749	−48.780	1.00	26.20
ATOM	4259	CA	VAL	A	564	19.877	27.837	−49.206	1.00	28.74
ATOM	4260	CB	VAL	A	564	19.156	29.091	−49.832	1.00	28.91
ATOM	4261	CG1	VAL	A	564	19.461	30.408	−49.087	1.00	31.10
ATOM	4262	CG2	VAL	A	564	17.655	28.836	−50.079	1.00	28.92
ATOM	4263	C	VAL	A	564	20.886	28.181	−48.122	1.00	29.56
ATOM	4264	O	VAL	A	564	20.538	28.320	−46.954	1.00	29.10
ATOM	4265	N	GLY	A	565	22.150	28.266	−48.527	1.00	32.02
ATOM	4266	CA	GLY	A	565	23.252	28.423	−47.577	1.00	34.92
ATOM	4267	C	GLY	A	565	23.539	29.876	−47.248	1.00	37.47
ATOM	4268	O	GLY	A	565	22.969	30.788	−47.871	1.00	37.66
ATOM	4269	N	GLN	A	566	24.419	30.098	−46.267	1.00	39.85
ATOM	4270	CA	GLN	A	566	24.897	31.456	−45.926	1.00	42.75
ATOM	4271	CB	GLN	A	566	26.054	31.398	−44.918	1.00	42.83
ATOM	4272	CG	GLN	A	566	25.727	30.761	−43.565	1.00	44.99
ATOM	4273	CD	GLN	A	566	26.940	30.689	−42.626	1.00	44.88
ATOM	4274	OE1	GLN	A	566	27.972	30.089	−42.958	1.00	47.67
ATOM	4275	NE2	GLN	A	566	26.810	31.293	−41.441	1.00	47.62
ATOM	4276	C	GLN	A	566	25.373	32.195	−47.181	1.00	43.30
ATOM	4277	O	GLN	A	566	25.052	33.365	−47.389	1.00	44.01
ATOM	4278	N	ASP	A	567	26.118	31.479	−48.023	1.00	44.30
ATOM	4279	CA	ASP	A	567	26.739	32.029	−49.236	1.00	44.62
ATOM	4280	CB	ASP	A	567	27.916	31.139	−49.650	1.00	45.13
ATOM	4281	CG	ASP	A	567	27.492	29.702	−49.966	1.00	47.62
ATOM	4282	OD1	ASP	A	567	26.421	29.255	−49.485	1.00	48.73
ATOM	4283	OD2	ASP	A	567	28.245	29.010	−50.693	1.00	50.47
ATOM	4284	C	ASP	A	567	25.776	32.197	−50.421	1.00	44.04
ATOM	4285	O	ASP	A	567	26.196	32.575	−51.522	1.00	44.36
ATOM	4286	N	GLY	A	568	24.497	31.899	−50.205	1.00	42.85
ATOM	4287	CA	GLY	A	568	23.488	32.045	−51.247	1.00	41.38
ATOM	4288	C	GLY	A	568	23.359	30.851	−52.177	1.00	40.41
ATOM	4289	O	GLY	A	568	22.496	30.854	−53.054	1.00	40.62
ATOM	4290	N	SER	A	569	24.195	29.827	−51.990	1.00	39.02
ATOM	4291	CA	SER	A	569	24.137	28.623	−52.827	1.00	37.72
ATOM	4292	CB	SER	A	569	25.365	27.746	−52.600	1.00	38.07
ATOM	4293	OG	SER	A	569	25.454	27.359	−51.238	1.00	39.18
ATOM	4294	C	SER	A	569	22.868	27.819	−52.540	1.00	36.72
ATOM	4295	O	SER	A	569	22.474	27.672	−51.382	1.00	36.47
ATOM	4296	N	VAL	A	570	22.222	27.313	−53.583	1.00	35.25
ATOM	4297	CA	VAL	A	570	20.988	26.558	−53.365	1.00	34.26
ATOM	4298	CB	VAL	A	570	19.709	27.243	−53.987	1.00	34.42
ATOM	4299	CG1	VAL	A	570	18.992	26.358	−55.020	1.00	35.11
ATOM	4300	CG2	VAL	A	570	20.010	28.651	−54.506	1.00	35.12
ATOM	4301	C	VAL	A	570	21.113	25.080	−53.718	1.00	33.29
ATOM	4302	O	VAL	A	570	21.735	24.694	−54.714	1.00	32.88
ATOM	4303	N	THR	A	571	20.515	24.261	−52.864	1.00	31.66
ATOM	4304	CA	THR	A	571	20.480	22.825	−53.021	1.00	30.87
ATOM	4305	CB	THR	A	571	21.016	22.146	−51.752	1.00	30.96
ATOM	4306	OG1	THR	A	571	22.311	22.686	−51.442	1.00	33.18
ATOM	4307	CG2	THR	A	571	21.117	20.637	−51.935	1.00	30.95
ATOM	4308	C	THR	A	571	19.018	22.473	−53.210	1.00	29.72
ATOM	4309	O	THR	A	571	18.186	22.832	−52.373	1.00	28.84
ATOM	4310	N	TRP	A	572	18.697	21.846	−54.337	1.00	29.01
ATOM	4311	CA	TRP	A	572	17.331	21.388	−54.589	1.00	28.49
ATOM	4312	CB	TRP	A	572	17.004	21.367	−56.086	1.00	28.99
ATOM	4313	CG	TRP	A	572	16.950	22.690	−56.739	1.00	29.65
ATOM	4314	CD1	TRP	A	572	18.014	23.419	−57.217	1.00	30.67
ATOM	4315	NE1	TRP	A	572	17.564	24.603	−57.769	1.00	31.84
ATOM	4316	CE2	TRP	A	572	16.196	24.655	−57.668	1.00	30.45
ATOM	4317	CD2	TRP	A	572	15.770	23.464	−57.028	1.00	30.30
ATOM	4318	CE3	TRP	A	572	14.398	23.274	−56.791	1.00	29.43

TABLE 15-continued

ATOM	4319	CZ3	TRP	A	572	13.502	24.266	−57.205	1.00	30.24
ATOM	4320	CH2	TRP	A	572	13.959	25.437	−57.846	1.00	30.31
ATOM	4321	CZ2	TRP	A	572	15.298	25.649	−58.083	1.00	29.71
ATOM	4322	C	TRP	A	572	17.205	19.991	−54.031	1.00	28.21
ATOM	4323	O	TRP	A	572	18.168	19.212	−54.060	1.00	27.50
ATOM	4324	N	GLU	A	573	16.033	19.647	−53.499	1.00	27.69
ATOM	4325	CA	GLU	A	573	15.819	18.251	−53.123	1.00	27.17
ATOM	4326	CB	GLU	A	573	14.586	18.074	−52.222	1.00	27.18
ATOM	4327	CG	GLU	A	573	13.287	18.406	−52.901	1.00	26.04
ATOM	4328	CD	GLU	A	573	12.059	18.111	−52.028	1.00	26.20
ATOM	4329	OE1	GLU	A	573	12.112	17.224	−51.141	1.00	25.84
ATOM	4330	OE2	GLU	A	573	11.032	18.764	−52.264	1.00	22.24
ATOM	4331	C	GLU	A	573	15.725	17.419	−54.405	1.00	27.91
ATOM	4332	O	GLU	A	573	15.498	17.957	−55.497	1.00	26.94
ATOM	4333	N	SER	A	574	15.907	16.108	−54.267	1.00	28.48
ATOM	4334	CA	SER	A	574	15.880	15.201	−55.410	1.00	29.59
ATOM	4335	CB	SER	A	574	16.296	13.805	−54.975	1.00	29.73
ATOM	4336	OG	SER	A	574	17.609	13.875	−54.449	1.00	32.74
ATOM	4337	C	SER	A	574	14.526	15.134	−56.095	1.00	29.70
ATOM	4338	O	SER	A	574	13.500	15.482	−55.513	1.00	29.12
ATOM	4339	N	ASP	A	575	14.544	14.669	−57.339	1.00	29.54
ATOM	4340	CA	ASP	A	575	13.337	14.435	−58.109	1.00	29.98
ATOM	4341	CB	ASP	A	575	13.705	14.000	−59.534	1.00	30.69
ATOM	4342	CG	ASP	A	575	14.324	15.125	−60.331	1.00	33.96
ATOM	4343	OD1	ASP	A	575	14.056	16.299	−59.997	1.00	36.25
ATOM	4344	OD2	ASP	A	575	15.083	14.846	−61.290	1.00	37.94
ATOM	4345	C	ASP	A	575	12.519	13.358	−57.428	1.00	28.93
ATOM	4346	O	ASP	A	575	13.050	12.633	−56.600	1.00	28.34
ATOM	4347	N	PRO	A	576	11.217	13.267	−57.760	1.00	28.58
ATOM	4348	CA	PRO	A	576	10.469	14.173	−58.650	1.00	27.92
ATOM	4349	CB	PRO	A	576	9.319	13.294	−59.131	1.00	28.52
ATOM	4350	CG	PRO	A	576	9.053	12.378	−57.954	1.00	28.29
ATOM	4351	CD	PRO	A	576	10.377	12.159	−57.267	1.00	28.76
ATOM	4352	C	PRO	A	576	9.894	15.397	−57.938	1.00	27.25
ATOM	4353	O	PRO	A	576	9.887	15.452	−56.703	1.00	28.13
ATOM	4354	N	ASN	A	577	9.394	16.360	−58.707	1.00	25.62
ATOM	4355	CA	ASN	A	577	8.612	17.449	−58.129	1.00	24.83
ATOM	4356	CB	ASN	A	577	8.013	18.336	−59.224	1.00	24.90
ATOM	4357	CG	ASN	A	577	9.055	19.184	−59.913	1.00	25.61
ATOM	4358	OD1	ASN	A	577	10.176	19.321	−59.423	1.00	25.83
ATOM	4359	ND2	ASN	A	577	8.693	19.756	−61.060	1.00	25.07
ATOM	4360	C	ASN	A	577	7.466	16.868	−57.322	1.00	24.22
ATOM	4361	O	ASN	A	577	6.949	15.798	−57.672	1.00	23.69
ATOM	4362	N	HIS	A	578	7.057	17.562	−56.259	1.00	23.20
ATOM	4363	CA	HIS	A	578	5.830	17.179	−55.570	1.00	22.96
ATOM	4364	CB	HIS	A	578	5.734	17.844	−54.200	1.00	22.09
ATOM	4365	CG	HIS	A	578	6.874	17.538	−53.285	1.00	21.80
ATOM	4366	ND1	HIS	A	578	6.809	16.558	−52.318	1.00	21.62
ATOM	4367	CE1	HIS	A	578	7.948	16.530	−51.645	1.00	21.36
ATOM	4368	NE2	HIS	A	578	8.743	17.465	−52.133	1.00	20.16
ATOM	4369	CD2	HIS	A	578	8.096	18.109	−53.160	1.00	19.78
ATOM	4370	C	HIS	A	578	4.697	17.707	−56.429	1.00	23.58
ATOM	4371	O	HIS	A	578	4.814	18.794	−56.976	1.00	23.64
ATOM	4372	N	THR	A	579	3.603	16.955	−56.534	1.00	23.98
ATOM	4373	CA	THR	A	579	2.426	17.448	−57.254	1.00	25.34
ATOM	4374	CB	THR	A	579	2.092	16.568	−58.477	1.00	26.08
ATOM	4375	OG1	THR	A	579	3.162	16.672	−59.429	1.00	29.14
ATOM	4376	CG2	THR	A	579	0.749	16.979	−59.126	1.00	26.14
ATOM	4377	C	THR	A	579	1.259	17.480	−56.291	1.00	25.05
ATOM	4378	O	THR	A	579	0.977	16.487	−55.629	1.00	25.73
ATOM	4379	N	TYR	A	580	0.591	18.619	−56.213	1.00	25.23
ATOM	4380	CA	TYR	A	580	−0.450	18.802	−55.211	1.00	25.68
ATOM	4381	CB	TYR	A	580	0.098	19.556	−53.976	1.00	25.88
ATOM	4382	CG	TYR	A	580	−0.931	19.763	−52.866	1.00	26.21
ATOM	4383	CD1	TYR	A	580	−1.284	21.048	−52.429	1.00	26.22
ATOM	4384	CE1	TYR	A	580	−2.256	21.233	−51.399	1.00	27.53
ATOM	4385	CZ	TYR	A	580	−2.860	20.111	−50.841	1.00	27.08
ATOM	4386	OH	TYR	A	580	−3.806	20.207	−49.844	1.00	27.88
ATOM	4387	CE2	TYR	A	580	−2.510	18.841	−51.264	1.00	26.97
ATOM	4388	CD2	TYR	A	580	−1.562	18.671	−52.276	1.00	26.29
ATOM	4389	C	TYR	A	580	−1.634	19.523	−55.828	1.00	25.65
ATOM	4390	O	TYR	A	580	−1.490	20.596	−56.403	1.00	25.29
ATOM	4391	N	THR	A	581	−2.813	18.915	−55.732	1.00	25.95
ATOM	4392	CA	THR	A	581	−4.015	19.629	−56.117	1.00	25.78
ATOM	4393	CB	THR	A	581	−5.016	18.700	−56.806	1.00	26.75
ATOM	4394	OG1	THR	A	581	−4.332	18.000	−57.855	1.00	26.57
ATOM	4395	CG2	THR	A	581	−6.189	19.498	−57.397	1.00	27.62
ATOM	4396	C	THR	A	581	−4.627	20.285	−54.874	1.00	25.36
ATOM	4397	O	THR	A	581	−5.024	19.595	−53.935	1.00	25.22
ATOM	4398	N	VAL	A	582	−4.685	21.615	−54.880	1.00	24.54

TABLE 15-continued

ATOM	4399	CA	VAL	A	582	−5.255	22.382	−53.777	1.00	24.15
ATOM	4400	CB	VAL	A	582	−5.006	23.915	−53.953	1.00	24.21
ATOM	4401	CG1	VAL	A	582	−5.472	24.700	−52.744	1.00	23.87
ATOM	4402	CG2	VAL	A	582	−3.514	24.218	−54.219	1.00	25.33
ATOM	4403	C	VAL	A	582	−6.759	22.063	−53.706	1.00	24.32
ATOM	4404	O	VAL	A	582	−7.478	22.204	−54.700	1.00	23.26
ATOM	4405	N	PRO	A	583	−7.236	21.587	−52.546	1.00	24.10
ATOM	4406	CA	PRO	A	583	−8.665	21.230	−52.476	1.00	24.34
ATOM	4407	CB	PRO	A	583	−8.865	20.763	−51.022	1.00	24.33
ATOM	4408	CG	PRO	A	583	−7.516	20.538	−50.468	1.00	25.16
ATOM	4409	CD	PRO	A	583	−6.508	21.310	−51.294	1.00	24.72
ATOM	4410	C	PRO	A	583	−9.597	22.404	−52.768	1.00	24.50
ATOM	4411	O	PRO	A	583	−9.262	23.558	−52.487	1.00	23.93
ATOM	4412	N	ALA	A	584	−10.756	22.104	−53.350	1.00	24.61
ATOM	4413	CA	ALA	A	584	−11.817	23.084	−53.477	1.00	24.77
ATOM	4414	CB	ALA	A	584	−12.065	23.439	−54.943	1.00	25.29
ATOM	4415	C	ALA	A	584	−13.036	22.434	−52.847	1.00	24.94
ATOM	4416	O	ALA	A	584	−13.922	21.932	−53.537	1.00	25.03
ATOM	4417	N	VAL	A	585	−13.052	22.406	−51.517	1.00	24.24
ATOM	4418	CA	VAL	A	585	−14.075	21.673	−50.776	1.00	23.75
ATOM	4419	CB	VAL	A	585	−13.465	20.452	−50.029	1.00	24.50
ATOM	4420	CG1	VAL	A	585	−14.515	19.770	−49.151	1.00	24.48
ATOM	4421	CG2	VAL	A	585	−12.863	19.447	−51.026	1.00	25.32
ATOM	4422	C	VAL	A	585	−14.707	22.639	−49.781	1.00	23.20
ATOM	4423	O	VAL	A	585	−13.999	23.347	−49.065	1.00	22.13
ATOM	4424	N	ALA	A	586	−16.044	22.679	−49.739	1.00	22.43
ATOM	4425	CA	ALA	A	586	−16.749	23.546	−48.804	1.00	21.79
ATOM	4426	CB	ALA	A	586	−18.240	23.212	−48.820	1.00	22.19
ATOM	4427	C	ALA	A	586	−16.160	23.324	−47.389	1.00	21.57
ATOM	4428	O	ALA	A	586	−15.954	22.180	−46.990	1.00	20.89
ATOM	4429	N	CYS	A	587	−15.872	24.414	−46.679	1.00	21.59
ATOM	4430	CA	CYS	A	587	−15.388	24.379	−45.268	1.00	21.68
ATOM	4431	CB	CYS	A	587	−16.131	23.323	−44.441	1.00	22.08
ATOM	4432	SG	CYS	A	587	−17.952	23.374	−44.507	1.00	23.60
ATOM	4433	C	CYS	A	587	−13.886	24.129	−45.094	1.00	21.27
ATOM	4434	O	CYS	A	587	−13.386	24.225	−43.980	1.00	21.08
ATOM	4435	N	VAL	A	588	−13.178	23.780	−46.170	1.00	20.53
ATOM	4436	CA	VAL	A	588	−11.742	23.499	−46.085	1.00	20.52
ATOM	4437	CB	VAL	A	588	−11.351	22.268	−46.958	1.00	20.47
ATOM	4438	CG1	VAL	A	588	−9.846	21.959	−46.844	1.00	20.87
ATOM	4439	CG2	VAL	A	588	−12.163	21.042	−46.549	1.00	20.51
ATOM	4440	C	VAL	A	588	−10.949	24.731	−46.504	1.00	20.59
ATOM	4441	O	VAL	A	588	−10.699	24.950	−47.705	1.00	21.88
ATOM	4442	N	THR	A	589	−10.533	25.522	−45.528	1.00	19.56
ATOM	4443	CA	THR	A	589	−9.903	26.807	−45.795	1.00	19.48
ATOM	4444	CB	THR	A	589	−10.595	27.914	−44.988	1.00	20.13
ATOM	4445	OG1	THR	A	589	−10.527	27.565	−43.592	1.00	21.49
ATOM	4446	CG2	THR	A	589	−12.085	28.018	−45.410	1.00	20.03
ATOM	4447	C	THR	A	589	−8.424	26.819	−45.427	1.00	19.42
ATOM	4448	O	THR	A	589	−7.694	27.767	−45.743	1.00	18.66
ATOM	4449	N	GLN	A	590	−7.995	25.772	−44.734	1.00	19.62
ATOM	4450	CA	GLN	A	590	−6.606	25.629	−44.317	1.00	20.20
ATOM	4451	CB	GLN	A	590	−6.359	26.261	−42.939	1.00	21.06
ATOM	4452	CG	GLN	A	590	−4.950	25.956	−42.410	1.00	27.00
ATOM	4453	CD	GLN	A	590	−4.184	27.189	−41.989	1.00	33.74
ATOM	4454	OE1	GLN	A	590	−4.771	28.196	−41.611	1.00	37.22
ATOM	4455	NE2	GLN	A	590	−2.855	27.118	−42.066	1.00	36.77
ATOM	4456	C	GLN	A	590	−6.247	24.159	−44.295	1.00	19.00
ATOM	4457	O	GLN	A	590	−7.004	23.335	−43.771	1.00	18.70
ATOM	4458	N	VAL	A	591	−5.113	23.811	−44.904	1.00	17.70
ATOM	4459	CA	VAL	A	591	−4.682	22.404	−44.940	1.00	17.15
ATOM	4460	CB	VAL	A	591	−4.843	21.750	−46.330	1.00	17.82
ATOM	4461	CG1	VAL	A	591	−6.316	21.701	−46.744	1.00	18.11
ATOM	4462	CG2	VAL	A	591	−3.970	22.470	−47.390	1.00	17.60
ATOM	4463	C	VAL	A	591	−3.213	22.360	−44.551	1.00	17.42
ATOM	4464	O	VAL	A	591	−2.531	23.377	−44.638	1.00	17.32
ATOM	4465	N	VAL	A	592	−2.731	21.206	−44.090	1.00	17.26
ATOM	4466	CA	VAL	A	592	−1.291	21.092	−43.887	1.00	17.03
ATOM	4467	CB	VAL	A	592	−0.762	21.198	−42.365	1.00	18.70
ATOM	4468	CG1	VAL	A	592	0.335	20.217	−41.930	1.00	18.75
ATOM	4469	CG2	VAL	A	592	−1.810	21.731	−41.315	1.00	15.36
ATOM	4470	C	VAL	A	592	−0.736	19.951	−44.730	1.00	16.99
ATOM	4471	O	VAL	A	592	−1.318	18.862	−44.828	1.00	16.23
ATOM	4472	N	LYS	A	593	0.357	20.253	−45.403	1.00	15.38
ATOM	4473	CA	LYS	A	593	0.953	19.302	−46.293	1.00	16.27
ATOM	4474	CB	LYS	A	593	1.301	20.010	−47.616	1.00	16.69
ATOM	4475	CG	LYS	A	593	1.835	19.096	−48.694	1.00	20.55
ATOM	4476	CD	LYS	A	593	0.791	18.101	−49.203	1.00	24.73
ATOM	4477	CE	LYS	A	593	1.330	17.311	−50.409	1.00	27.26
ATOM	4478	NZ	LYS	A	593	2.395	16.299	−50.074	1.00	28.37

TABLE 15-continued

ATOM	4479	C	LYS	A	593	2.209	18.783	−45.588	1.00	16.01
ATOM	4480	O	LYS	A	593	3.175	19.525	−45.427	1.00	15.12
ATOM	4481	N	GLU	A	594	2.195	17.519	−45.175	1.00	15.82
ATOM	4482	CA	GLU	A	594	3.308	16.969	−44.407	1.00	16.23
ATOM	4483	CB	GLU	A	594	2.798	16.017	−43.317	1.00	16.26
ATOM	4484	CG	GLU	A	594	1.866	16.732	−42.299	1.00	16.62
ATOM	4485	CD	GLU	A	594	1.727	15.949	−40.991	1.00	18.94
ATOM	4486	OE1	GLU	A	594	1.267	14.778	−41.024	1.00	21.31
ATOM	4487	OE2	GLU	A	594	2.107	16.507	−39.940	1.00	16.43
ATOM	4488	C	GLU	A	594	4.286	16.245	−45.323	1.00	17.34
ATOM	4489	O	GLU	A	594	3.973	15.177	−45.852	1.00	17.78
ATOM	4490	N	ASP	A	595	5.463	16.833	−45.487	1.00	17.05
ATOM	4491	CA	ASP	A	595	6.481	16.326	−46.405	1.00	17.21
ATOM	4492	CB	ASP	A	595	6.823	17.379	−47.475	1.00	16.63
ATOM	4493	CG	ASP	A	595	5.678	17.619	−48.455	1.00	17.91
ATOM	4494	OD1	ASP	A	595	5.023	16.631	−48.857	1.00	20.73
ATOM	4495	OD2	ASP	A	595	5.434	18.795	−48.844	1.00	18.08
ATOM	4496	C	ASP	A	595	7.734	15.955	−45.631	1.00	17.47
ATOM	4497	O	ASP	A	595	7.915	16.375	−44.492	1.00	16.44
ATOM	4498	N	THR	A	596	8.598	15.162	−46.277	1.00	18.11
ATOM	4499	CA	THR	A	596	9.917	14.835	−45.747	1.00	18.85
ATOM	4500	CB	THR	A	596	9.991	13.390	−45.188	1.00	19.58
ATOM	4501	OG1	THR	A	596	9.057	13.248	−44.116	1.00	20.97
ATOM	4502	CG2	THR	A	596	11.385	13.124	−44.598	1.00	20.94
ATOM	4503	C	THR	A	596	10.895	14.978	−46.914	1.00	19.34
ATOM	4504	O	THR	A	596	10.588	14.531	−48.024	1.00	19.05
ATOM	4505	N	TRP	A	597	12.050	15.581	−46.631	1.00	20.24
ATOM	4506	CA	TRP	A	597	13.074	15.921	−47.633	1.00	21.94
ATOM	4507	CB	TRP	A	597	14.325	16.453	−46.940	1.00	22.34
ATOM	4508	CG	TRP	A	597	15.445	16.854	−47.882	1.00	23.75
ATOM	4509	CD1	TRP	A	597	16.509	16.079	−48.275	1.00	25.08
ATOM	4510	NE1	TRP	A	597	17.327	16.801	−49.138	1.00	24.85
ATOM	4511	CE2	TRP	A	597	16.802	18.059	−49.300	1.00	25.25
ATOM	4512	CD2	TRP	A	597	15.611	18.128	−48.527	1.00	24.09
ATOM	4513	CE3	TRP	A	597	14.875	19.325	−48.519	1.00	24.91
ATOM	4514	CZ3	TRP	A	597	15.334	20.401	−49.262	1.00	23.38
ATOM	4515	CH2	TRP	A	597	16.520	20.299	−50.028	1.00	25.14
ATOM	4516	CZ2	TRP	A	597	17.265	19.137	−50.053	1.00	22.49
ATOM	4517	C	TRP	A	597	13.424	14.708	−48.473	1.00	23.42
ATOM	4518	O	TRP	A	597	13.675	13.635	−47.939	1.00	22.37
ATOM	4519	N	GLN	A	598	13.409	14.904	−49.788	1.00	25.26
ATOM	4520	CA	GLN	A	598	13.698	13.850	−50.755	1.00	27.05
ATOM	4521	CB	GLN	A	598	12.936	14.124	−52.052	1.00	26.51
ATOM	4522	CG	GLN	A	598	11.418	13.948	−51.895	1.00	26.10
ATOM	4523	CD	GLN	A	598	10.642	14.209	−53.156	1.00	26.76
ATOM	4524	OE1	GLN	A	598	11.194	14.620	−54.175	1.00	27.68
ATOM	4525	NE2	GLN	A	598	9.340	13.990	−53.095	1.00	25.96
ATOM	4526	C	GLN	A	598	15.204	13.787	−50.977	1.00	29.21
ATOM	4527	O	GLN	A	598	15.794	14.694	−51.574	1.00	28.61
ATOM	4528	N	SER	A	599	15.818	12.722	−50.453	1.00	32.41
ATOM	4529	CA	SER	A	599	17.273	12.530	−50.498	1.00	35.70
ATOM	4530	CB	SER	A	599	17.747	11.698	−49.302	1.00	35.61
ATOM	4531	OG	SER	A	599	17.374	12.296	−48.072	1.00	39.62
ATOM	4532	C	SER	A	599	17.703	11.831	−51.785	1.00	36.66
ATOM	4533	O	SER	A	599	16.916	11.145	−52.433	1.00	37.44
ATOM	4534	OXT	SER	A	599	18.863	11.922	−52.194	1.00	38.18
ATOM	4535	C1	MAN	A	601	−3.602	−3.018	−46.412	1.00	102.64
ATOM	4536	C2	MAN	A	601	−4.584	−2.109	−47.156	1.00	102.73
ATOM	4537	O2	MAN	A	601	−3.951	−1.548	−48.288	1.00	102.91
ATOM	4538	C3	MAN	A	601	−5.867	−2.845	−47.570	1.00	102.38
ATOM	4539	O3	MAN	A	601	−6.544	−2.112	−48.566	1.00	102.32
ATOM	4540	C4	MAN	A	601	−5.640	−4.269	−48.082	1.00	102.18
ATOM	4541	O4	MAN	A	601	−6.860	−4.967	−47.984	1.00	101.76
ATOM	4542	C5	MAN	A	601	−4.561	−5.018	−47.298	1.00	102.40
ATOM	4543	C6	MAN	A	601	−4.172	−6.307	−48.010	1.00	102.48
ATOM	4544	O6	MAN	A	601	−3.156	−6.957	−47.280	1.00	102.80
ATOM	4545	O5	MAN	A	601	−3.400	−4.222	−47.131	1.00	102.71
ATOM	4546	C1	MAN	A	602	−29.428	−4.974	−42.477	1.00	77.32
ATOM	4547	C2	MAN	A	602	−28.973	−6.434	−42.405	1.00	77.44
ATOM	4548	O2	MAN	A	602	−30.120	−7.253	−42.347	1.00	77.72
ATOM	4549	C3	MAN	A	602	−28.044	−6.835	−43.565	1.00	77.20
ATOM	4550	O3	MAN	A	602	−27.940	−8.239	−43.664	1.00	76.96
ATOM	4551	C4	MAN	A	602	−28.487	−6.260	−44.909	1.00	77.22
ATOM	4552	O4	MAN	A	602	−27.471	−6.474	−45.862	1.00	76.90
ATOM	4553	C5	MAN	A	602	−28.766	−4.766	−44.768	1.00	77.47
ATOM	4554	C6	MAN	A	602	−29.185	−4.115	−46.081	1.00	77.84
ATOM	4555	O6	MAN	A	602	−28.163	−3.228	−46.483	1.00	78.24
ATOM	4556	O5	MAN	A	602	−29.768	−4.562	−43.790	1.00	77.46
ATOM	4557	C1	MAN	A	603	−18.689	25.235	−53.677	1.00	47.04
ATOM	4558	C2	MAN	A	603	−20.074	24.872	−53.114	1.00	51.09

TABLE 15-continued

ATOM	4559	O2	MAN	A	603	−21.044	25.065	−54.120	1.00	52.42
ATOM	4560	C3	MAN	A	603	−20.141	23.420	−52.620	1.00	51.78
ATOM	4561	O3	MAN	A	603	−21.465	23.079	−52.262	1.00	53.36
ATOM	4562	C4	MAN	A	603	−19.602	22.466	−53.686	1.00	51.72
ATOM	4563	O4	MAN	A	603	−19.615	21.142	−53.209	1.00	51.94
ATOM	4564	C5	MAN	A	603	−18.179	22.911	−54.021	1.00	51.66
ATOM	4565	C6	MAN	A	603	−17.421	21.906	−54.892	1.00	53.80
ATOM	4566	O6	MAN	A	603	−17.915	21.885	−56.214	1.00	55.49
ATOM	4567	O5	MAN	A	603	−18.217	24.223	−54.581	1.00	49.62
ATOM	4568	C1	MAN	A	605	−4.678	15.117	−57.896	1.00	58.79
ATOM	4569	C2	MAN	A	605	−3.360	15.555	−58.538	1.00	58.65
ATOM	4570	O2	MAN	A	605	−2.564	14.412	−58.722	1.00	59.38
ATOM	4571	C3	MAN	A	605	−3.570	16.269	−59.878	1.00	58.70
ATOM	4572	O3	MAN	A	605	−2.523	15.985	−60.778	1.00	59.27
ATOM	4573	C4	MAN	A	605	−4.915	15.892	−60.491	1.00	58.73
ATOM	4574	O4	MAN	A	605	−5.084	16.538	−61.730	1.00	59.62
ATOM	4575	C5	MAN	A	605	−6.054	16.284	−59.547	1.00	58.90
ATOM	4576	C6	MAN	A	605	−7.370	15.612	−59.932	1.00	58.75
ATOM	4577	O6	MAN	A	605	−7.255	14.219	−59.738	1.00	59.42
ATOM	4578	O5	MAN	A	605	−5.730	16.034	−58.173	1.00	58.30
ATOM	4579	C1	MAN	A	606	−10.273	28.688	−42.727	1.00	25.90
ATOM	4580	C2	MAN	A	606	−9.839	27.944	−41.452	1.00	28.64
ATOM	4581	O2	MAN	A	606	−9.245	28.909	−40.620	1.00	28.84
ATOM	4582	C3	MAN	A	606	−10.999	27.249	−40.710	1.00	29.65
ATOM	4583	O3	MAN	A	606	−10.568	26.763	−39.441	1.00	28.85
ATOM	4584	C4	MAN	A	606	−12.203	28.177	−40.551	1.00	30.36
ATOM	4585	O4	MAN	A	606	−13.330	27.463	−40.084	1.00	30.29
ATOM	4586	C5	MAN	A	606	−12.553	28.769	−41.914	1.00	30.72
ATOM	4587	C6	MAN	A	606	−13.730	29.731	−41.778	1.00	33.97
ATOM	4588	O6	MAN	A	606	−13.624	30.732	−42.762	1.00	36.82
ATOM	4589	O5	MAN	A	606	−11.434	29.464	−42.435	1.00	28.12
ATOM	4590	C1	MAN	A	607	−31.396	1.963	−40.521	1.00	50.29
ATOM	4591	C2	MAN	A	607	−30.220	1.790	−41.485	1.00	52.65
ATOM	4592	O2	MAN	A	607	−30.541	0.785	−42.419	1.00	54.93
ATOM	4593	C3	MAN	A	607	−29.845	3.092	−42.208	1.00	52.48
ATOM	4594	O3	MAN	A	607	−28.932	2.836	−43.251	1.00	53.01
ATOM	4595	C4	MAN	A	607	−31.068	3.818	−42.766	1.00	52.78
ATOM	4596	O4	MAN	A	607	−30.672	5.070	−43.297	1.00	52.92
ATOM	4597	C5	MAN	A	607	−32.103	3.985	−41.652	1.00	52.23
ATOM	4598	C6	MAN	A	607	−33.331	4.749	−42.153	1.00	52.96
ATOM	4599	O6	MAN	A	607	−34.520	4.076	−41.791	1.00	52.95
ATOM	4600	O5	MAN	A	607	−32.451	2.702	−41.127	1.00	51.79
ATOM	4601	C1	MAN	A	608	3.870	15.416	−59.489	1.00	37.21
ATOM	4602	C2	MAN	A	608	5.134	15.938	−60.168	1.00	40.45
ATOM	4603	O2	MAN	A	608	6.091	14.903	−60.120	1.00	38.47
ATOM	4604	C3	MAN	A	608	4.872	16.381	−61.608	1.00	42.66
ATOM	4605	O3	MAN	A	608	6.071	16.726	−62.263	1.00	44.20
ATOM	4606	C4	MAN	A	608	4.122	15.321	−62.401	1.00	44.80
ATOM	4607	O4	MAN	A	608	3.708	15.907	−63.612	1.00	47.73
ATOM	4608	C5	MAN	A	608	2.893	14.887	−61.597	1.00	44.80
ATOM	4609	C6	MAN	A	608	2.042	13.861	−62.342	1.00	47.55
ATOM	4610	O6	MAN	A	608	1.085	14.582	−63.104	1.00	49.87
ATOM	4611	O5	MAN	A	608	3.262	14.423	−60.302	1.00	42.18
ATOM	4612	C1	NAG	A	611	3.450	−2.354	−8.282	1.00	23.44
ATOM	4613	C2	NAG	A	611	3.474	−0.875	−7.878	1.00	24.51
ATOM	4614	N2	NAG	A	611	4.425	−0.077	−8.630	1.00	21.95
ATOM	4615	C7	NAG	A	611	4.123	0.454	−9.818	1.00	22.94
ATOM	4616	O7	NAG	A	611	3.030	0.322	−10.367	1.00	20.93
ATOM	4617	C8	NAG	A	611	5.216	1.232	−10.481	1.00	21.54
ATOM	4618	C3	NAG	A	611	3.741	−0.713	−6.380	1.00	25.60
ATOM	4619	O3	NAG	A	611	3.676	0.655	−6.047	1.00	24.91
ATOM	4620	C4	NAG	A	611	2.741	−1.528	−5.554	1.00	25.70
ATOM	4621	O4	NAG	A	611	3.196	−1.598	−4.227	1.00	28.27
ATOM	4622	C5	NAG	A	611	2.648	−2.952	−6.086	1.00	26.18
ATOM	4623	C6	NAG	A	611	1.524	−3.738	−5.397	1.00	26.64
ATOM	4624	O6	NAG	A	611	0.278	−3.081	−5.497	1.00	25.38
ATOM	4625	O5	NAG	A	611	2.437	−2.975	−7.488	1.00	24.34
ATOM	4626	C1	NAG	A	612	2.499	−0.713	−3.326	1.00	32.04
ATOM	4627	C2	NAG	A	612	2.710	−1.192	−1.879	1.00	35.81
ATOM	4628	N2	NAG	A	612	2.254	−2.556	−1.666	1.00	37.89
ATOM	4629	C7	NAG	A	612	3.072	−3.605	−1.753	1.00	39.19
ATOM	4630	O7	NAG	A	612	4.277	−3.517	−2.031	1.00	40.58
ATOM	4631	C8	NAG	A	612	2.439	−4.947	−1.507	1.00	38.98
ATOM	4632	C3	NAG	A	612	2.012	−0.256	−0.899	1.00	37.96
ATOM	4633	O3	NAG	A	612	2.352	−0.666	0.403	1.00	41.23
ATOM	4634	C4	NAG	A	612	2.491	1.176	−1.129	1.00	37.63
ATOM	4635	O4	NAG	A	612	1.789	2.053	−0.278	1.00	40.85
ATOM	4636	C5	NAG	A	612	2.294	1.565	−2.604	1.00	35.10
ATOM	4637	C6	NAG	A	612	2.785	2.982	−2.903	1.00	31.93
ATOM	4638	O6	NAG	A	612	4.188	2.994	−3.008	0.58	32.70

TABLE 15-continued

ATOM	4639	O5	NAG	A	612	2.974	0.625	−3.425	1.00	31.95
ATOM	4640	O8	BTB	A	620	−1.213	18.638	−21.639	1.00	23.78
ATOM	4641	C8	BTB	A	620	−1.255	19.440	−22.838	1.00	17.50
ATOM	4642	C7	BTB	A	620	−2.257	18.851	−23.831	1.00	15.39
ATOM	4643	N	BTB	A	620	−1.808	17.505	−24.294	1.00	13.88
ATOM	4644	C5	BTB	A	620	−1.274	17.600	−25.684	1.00	12.99
ATOM	4645	C6	BTB	A	620	0.017	18.399	−25.786	1.00	14.67
ATOM	4646	O6	BTB	A	620	0.949	18.004	−24.768	1.00	16.93
ATOM	4647	C2	BTB	A	620	−2.926	16.495	−24.191	1.00	13.33
ATOM	4648	C4	BTB	A	620	−4.238	16.972	−24.835	1.00	13.45
ATOM	4649	O4	BTB	A	620	−4.167	17.018	−26.265	1.00	14.77
ATOM	4650	C3	BTB	A	620	−3.213	16.295	−22.703	1.00	13.18
ATOM	4651	O3	BTB	A	620	−1.984	15.920	−22.059	1.00	12.74
ATOM	4652	C1	BTB	A	620	−2.501	15.161	−24.845	1.00	13.57
ATOM	4653	O1	BTB	A	620	−3.463	14.138	−24.525	1.00	13.07
ATOM	4654	O	WAT	W	1	−7.741	16.530	−28.587	1.00	12.90
ATOM	4655	O	WAT	W	2	−1.955	18.721	−7.814	1.00	11.77
ATOM	4656	O	WAT	W	3	−17.101	16.033	−19.836	1.00	15.26
ATOM	4657	O	WAT	W	4	−1.389	7.464	−24.070	1.00	15.86
ATOM	4658	O	WAT	W	5	−8.070	20.758	−43.462	1.00	19.56
ATOM	4659	O	WAT	W	6	−12.959	28.534	−26.860	1.00	16.12
ATOM	4660	O	WAT	W	7	−0.502	31.488	−57.004	1.00	33.06
ATOM	4661	O	WAT	W	8	2.095	5.710	−17.808	1.00	18.68
ATOM	4662	O	WAT	W	9	−7.601	14.567	−6.827	1.00	14.97
ATOM	4663	O	WAT	W	10	24.863	23.325	−37.431	1.00	32.31
ATOM	4664	O	WAT	W	11	−22.569	7.289	−10.357	1.00	17.52
ATOM	4665	O	WAT	W	12	−18.987	1.758	−22.078	1.00	23.03
ATOM	4666	O	WAT	W	13	−3.226	16.264	−54.338	1.00	32.98
ATOM	4667	O	WAT	W	14	6.141	16.546	−42.196	1.00	16.00
ATOM	4668	O	WAT	W	15	−10.356	21.827	−22.675	1.00	13.52
ATOM	4669	O	WAT	W	16	−3.130	25.355	−17.925	1.00	14.01
ATOM	4670	O	WAT	W	17	−11.823	29.479	−29.411	1.00	17.50
ATOM	4671	O	WAT	W	18	−14.383	15.964	−19.553	1.00	13.02
ATOM	4672	O	WAT	W	19	−1.180	16.935	−10.101	1.00	18.86
ATOM	4673	O	WAT	W	20	−31.133	23.501	4.462	1.00	16.66
ATOM	4674	O	WAT	W	21	−4.819	24.193	−15.023	1.00	14.31
ATOM	4675	O	WAT	W	22	1.709	22.276	−4.126	1.00	21.96
ATOM	4676	O	WAT	W	23	−5.339	21.386	−7.463	1.00	15.78
ATOM	4677	O	WAT	W	24	−17.232	15.476	1.374	1.00	17.64
ATOM	4678	O	WAT	W	25	−11.449	4.860	−24.929	1.00	17.45
ATOM	4679	O	WAT	W	26	−17.555	17.679	−39.815	1.00	23.23
ATOM	4680	O	WAT	W	27	10.075	17.015	−49.295	1.00	24.05
ATOM	4681	O	WAT	W	28	−16.018	−0.740	−24.205	1.00	18.07
ATOM	4682	O	WAT	W	29	9.446	24.991	−37.612	1.00	19.20
ATOM	4683	O	WAT	W	30	−4.165	26.137	−12.642	1.00	18.33
ATOM	4684	O	WAT	W	31	2.771	22.947	−14.916	1.00	25.80
ATOM	4685	O	WAT	W	32	−12.297	21.394	−35.680	1.00	14.89
ATOM	4686	O	WAT	W	33	−24.061	13.570	10.081	1.00	24.96
ATOM	4687	O	WAT	W	34	10.032	29.725	−56.684	1.00	26.97
ATOM	4688	O	WAT	W	35	0.231	4.133	−28.595	1.00	17.67
ATOM	4689	O	WAT	W	36	0.335	2.173	−30.650	1.00	18.32
ATOM	4690	O	WAT	W	37	−10.199	24.315	−42.717	1.00	22.38
ATOM	4691	O	WAT	W	38	−14.151	12.872	−8.204	1.00	16.16
ATOM	4692	O	WAT	W	39	−2.710	9.564	−16.092	1.00	14.10
ATOM	4693	O	WAT	W	40	5.954	7.990	−32.401	1.00	16.59
ATOM	4694	O	WAT	W	41	0.294	5.561	−25.249	1.00	17.87
ATOM	4695	O	WAT	W	42	2.102	15.148	−37.718	1.00	14.64
ATOM	4696	O	WAT	W	43	−19.351	1.384	−26.295	1.00	20.27
ATOM	4697	O	WAT	W	44	−19.623	9.533	−17.751	1.00	14.67
ATOM	4698	O	WAT	W	45	3.117	18.767	−36.336	1.00	12.66
ATOM	4699	O	WAT	W	46	−15.016	16.950	0.662	1.00	20.14
ATOM	4700	O	WAT	W	47	−22.261	4.600	−10.993	1.00	16.38
ATOM	4701	O	WAT	W	48	−12.926	5.474	−22.680	1.00	19.85
ATOM	4702	O	WAT	W	49	5.564	17.071	−37.018	1.00	16.82
ATOM	4703	O	WAT	W	50	−19.848	20.552	−2.718	1.00	19.38
ATOM	4704	O	WAT	W	51	−15.859	17.744	−41.901	1.00	19.69
ATOM	4705	O	WAT	W	52	−16.430	25.522	−1.123	1.00	19.97
ATOM	4706	O	WAT	W	53	−15.978	5.366	−12.193	1.00	26.02
ATOM	4707	O	WAT	W	54	−1.637	9.365	−26.035	1.00	14.42
ATOM	4708	O	WAT	W	55	−10.759	27.212	−30.898	1.00	17.28
ATOM	4709	O	WAT	W	56	−11.509	0.756	−13.101	1.00	20.70
ATOM	4710	O	WAT	W	57	−16.950	15.108	4.727	1.00	23.86
ATOM	4711	O	WAT	W	58	−25.368	26.009	−7.106	1.00	25.08
ATOM	4712	O	WAT	W	59	−16.870	22.937	−3.651	1.00	17.56
ATOM	4713	O	WAT	W	60	−14.388	13.258	−40.897	1.00	27.90
ATOM	4714	O	WAT	W	61	−1.509	−4.779	−6.723	1.00	31.01
ATOM	4715	O	WAT	W	62	−1.973	27.723	−11.521	1.00	21.99
ATOM	4716	O	WAT	W	63	−1.159	−10.623	−29.592	1.00	36.68
ATOM	4717	O	WAT	W	64	−1.943	16.930	−42.957	1.00	21.57
ATOM	4718	O	WAT	W	65	−1.507	25.238	−40.032	1.00	31.36

TABLE 15-continued

ATOM	4719	O	WAT	W	66	−4.023	5.499	−31.787	1.00	20.03
ATOM	4720	O	WAT	W	67	−13.383	13.873	−21.065	1.00	12.01
ATOM	4721	O	WAT	W	68	−15.098	10.726	−24.467	1.00	24.34
ATOM	4722	O	WAT	W	69	−2.122	13.975	−13.435	1.00	12.51
ATOM	4723	O	WAT	W	70	−4.807	19.360	−43.270	1.00	20.93
ATOM	4724	O	WAT	W	71	−26.028	26.143	−33.768	1.00	28.78
ATOM	4725	O	WAT	W	72	−19.347	21.638	3.482	1.00	19.92
ATOM	4726	O	WAT	W	73	−27.299	24.219	−6.045	1.00	20.97
ATOM	4727	O	WAT	W	74	−21.114	−0.343	−28.050	1.00	22.38
ATOM	4728	O	WAT	W	75	−5.818	34.483	−11.645	1.00	20.61
ATOM	4729	O	WAT	W	76	6.048	1.098	−23.393	1.00	16.77
ATOM	4730	O	WAT	W	77	−3.946	23.711	−39.552	1.00	25.07
ATOM	4731	O	WAT	W	78	−18.572	21.631	−41.884	1.00	25.98
ATOM	4732	O	WAT	W	79	5.239	26.273	−31.646	1.00	27.95
ATOM	4733	O	WAT	W	80	0.054	15.597	−45.905	1.00	28.45
ATOM	4734	O	WAT	W	81	−3.130	21.534	−5.652	1.00	20.95
ATOM	4735	O	WAT	W	82	−12.534	4.331	−20.095	1.00	17.49
ATOM	4736	O	WAT	W	83	0.785	16.541	−14.558	1.00	14.65
ATOM	4737	O	WAT	W	84	−5.197	12.827	−31.553	1.00	14.10
ATOM	4738	O	WAT	W	85	−16.738	26.994	−34.463	1.00	23.74
ATOM	4739	O	WAT	W	86	3.596	22.076	−36.828	1.00	22.68
ATOM	4740	O	WAT	W	87	5.170	14.460	−40.572	1.00	26.56
ATOM	4741	O	WAT	W	88	−12.322	21.050	0.328	1.00	30.36
ATOM	4742	O	WAT	W	89	7.426	14.327	−48.857	1.00	26.44
ATOM	4743	O	WAT	W	90	−13.702	19.025	1.863	1.00	28.28
ATOM	4744	O	WAT	W	91	8.794	2.010	−23.444	1.00	34.69
ATOM	4745	O	WAT	W	92	−6.185	5.529	−30.210	1.00	17.03
ATOM	4746	O	WAT	W	93	−18.081	20.709	−4.839	1.00	17.61
ATOM	4747	O	WAT	W	94	−15.469	13.082	−22.717	1.00	15.55
ATOM	4748	O	WAT	W	95	13.101	16.811	−29.771	1.00	29.16
ATOM	4749	O	WAT	W	96	−25.944	7.031	−2.628	1.00	27.42
ATOM	4750	O	WAT	W	97	−4.552	34.207	−7.388	1.00	22.19
ATOM	4751	O	WAT	W	98	−2.231	−9.858	−32.291	1.00	26.28
ATOM	4752	O	WAT	W	99	5.314	10.271	−28.762	1.00	29.39
ATOM	4753	O	WAT	W	100	−15.379	27.478	−46.620	1.00	37.77
ATOM	4754	O	WAT	W	101	26.815	24.874	−36.295	1.00	31.11
ATOM	4755	O	WAT	W	102	−18.489	−0.112	−24.256	1.00	23.63
ATOM	4756	O	WAT	W	103	−23.763	26.890	−9.454	1.00	20.50
ATOM	4757	O	WAT	W	104	−10.933	23.904	−50.315	1.00	25.63
ATOM	4758	O	WAT	W	105	5.864	12.071	−41.668	1.00	29.27
ATOM	4759	O	WAT	W	106	2.526	9.409	−13.116	1.00	20.75
ATOM	4760	O	WAT	W	107	−11.557	−6.653	−10.981	1.00	30.68
ATOM	4761	O	WAT	W	108	−14.882	7.238	−22.254	1.00	24.81
ATOM	4762	O	WAT	W	109	−5.331	−13.390	−25.293	1.00	35.63
ATOM	4763	O	WAT	W	110	−8.068	24.248	−40.534	1.00	39.14
ATOM	4764	O	WAT	W	111	−0.779	14.419	−43.060	1.00	24.01
ATOM	4765	O	WAT	W	112	−22.279	12.054	−26.750	1.00	32.13
ATOM	4766	O	WAT	W	113	−26.829	1.352	−33.787	1.00	26.97
ATOM	4767	O	WAT	W	114	−14.120	14.116	3.214	1.00	36.89
ATOM	4768	O	WAT	W	115	0.582	−9.914	−21.103	1.00	23.30
ATOM	4769	O	WAT	W	116	−24.305	22.723	6.995	1.00	21.67
ATOM	4770	O	WAT	W	117	−28.275	12.468	−15.419	1.00	21.87
ATOM	4771	O	WAT	W	118	3.699	27.669	−20.781	1.00	34.08
ATOM	4772	O	WAT	W	119	−30.428	26.452	3.757	1.00	24.51
ATOM	4773	O	WAT	W	120	19.168	26.858	−59.022	1.00	33.45
ATOM	4774	O	WAT	W	121	−8.803	21.729	−1.693	1.00	18.30
ATOM	4775	O	WAT	W	122	2.863	1.621	−31.755	1.00	19.96
ATOM	4776	O	WAT	W	123	−2.357	28.930	−56.725	1.00	35.51
ATOM	4777	O	WAT	W	124	−16.780	5.504	−21.523	1.00	31.34
ATOM	4778	O	WAT	W	125	6.216	18.141	−30.592	1.00	20.87
ATOM	4779	O	WAT	W	126	11.789	32.722	−38.773	1.00	40.41
ATOM	4780	O	WAT	W	127	−5.001	7.195	−45.656	1.00	35.03
ATOM	4781	O	WAT	W	128	−18.743	1.608	−1.861	1.00	32.49
ATOM	4782	O	WAT	W	129	−25.089	−1.945	−20.935	1.00	35.17
ATOM	4783	O	WAT	W	130	−7.097	−2.177	−28.928	1.00	30.93
ATOM	4784	O	WAT	W	131	−12.591	2.907	−11.929	1.00	18.60
ATOM	4785	O	WAT	W	132	−17.913	−2.374	−39.429	1.00	29.36
ATOM	4786	O	WAT	W	133	−6.507	−7.038	−37.710	1.00	37.27
ATOM	4787	O	WAT	W	134	−0.628	7.596	−18.660	1.00	20.01
ATOM	4788	O	WAT	W	135	−11.683	28.527	−37.016	1.00	36.45
ATOM	4789	O	WAT	W	136	−3.169	33.267	−18.049	1.00	24.89
ATOM	4790	O	WAT	W	137	−16.742	8.938	−23.161	1.00	26.79
ATOM	4791	O	WAT	W	138	−28.456	17.726	−22.449	1.00	32.61
ATOM	4792	O	WAT	W	139	25.559	27.237	−45.392	1.00	43.21
ATOM	4793	O	WAT	W	140	−26.925	5.789	−41.722	1.00	26.97
ATOM	4794	O	WAT	W	141	−16.907	20.013	−43.283	1.00	29.68
ATOM	4795	O	WAT	W	142	−20.029	5.119	−1.799	1.00	24.76
ATOM	4796	O	WAT	W	143	8.706	1.050	−13.115	1.00	32.81
ATOM	4797	O	WAT	W	144	−4.353	22.506	−1.252	1.00	24.86
ATOM	4798	O	WAT	W	145	−29.660	14.750	−15.295	1.00	32.62

TABLE 15-continued

ATOM	4799	O	WAT	W	146	2.173	2.240	−12.124	1.00	26.38
ATOM	4800	O	WAT	W	147	4.174	−4.659	−14.794	1.00	25.20
ATOM	4801	O	WAT	W	148	−10.913	29.083	−33.130	1.00	27.78
ATOM	4802	O	WAT	W	149	−21.448	30.157	−10.670	1.00	25.07
ATOM	4803	O	WAT	W	150	−23.296	18.641	−36.646	1.00	27.11
ATOM	4804	O	WAT	W	151	−19.426	8.262	−24.240	1.00	25.11
ATOM	4805	O	WAT	W	152	4.729	−0.512	−31.679	1.00	23.50
ATOM	4806	O	WAT	W	153	9.247	19.703	−33.306	1.00	23.44
ATOM	4807	O	WAT	W	154	6.024	15.401	−22.768	1.00	27.11
ATOM	4808	O	WAT	W	155	−16.077	30.180	−4.530	1.00	23.52
ATOM	4809	O	WAT	W	156	−0.038	14.751	−8.812	1.00	25.64
ATOM	4810	O	WAT	W	157	2.962	18.631	−29.190	1.00	18.13
ATOM	4811	O	WAT	W	158	8.793	12.371	−36.745	1.00	23.77
ATOM	4812	O	WAT	W	159	−22.406	9.468	−0.415	1.00	21.66
ATOM	4813	O	WAT	W	160	−10.961	33.685	−7.076	1.00	25.30
ATOM	4814	O	WAT	W	161	−8.504	27.891	−3.964	1.00	33.88
ATOM	4815	O	WAT	W	162	6.836	20.663	−32.439	1.00	24.97
ATOM	4816	O	WAT	W	163	4.292	23.232	−29.206	1.00	32.74
ATOM	4817	O	WAT	W	164	2.350	3.656	−15.645	1.00	23.29
ATOM	4818	O	WAT	W	165	−17.377	10.190	−20.605	1.00	25.21
ATOM	4819	O	WAT	W	166	−23.426	24.714	4.551	1.00	26.12
ATOM	4820	O	WAT	W	167	0.338	1.730	−14.995	1.00	31.29
ATOM	4821	O	WAT	W	168	−3.303	17.836	−46.350	1.00	28.34
ATOM	4822	O	WAT	W	169	1.465	6.514	−14.840	1.00	22.81
ATOM	4823	O	WAT	W	170	2.409	11.466	−4.481	1.00	29.82
ATOM	4824	O	WAT	W	171	0.998	19.313	−20.348	1.00	31.57
ATOM	4825	O	WAT	W	172	7.556	−3.076	−34.213	1.00	31.62
ATOM	4826	O	WAT	W	173	−25.163	1.132	−18.852	1.00	33.45
ATOM	4827	O	WAT	W	174	−25.606	17.471	−26.509	1.00	27.89
ATOM	4828	O	WAT	W	175	5.952	32.621	−65.955	1.00	42.20
ATOM	4829	O	WAT	W	176	−27.397	26.421	−12.489	1.00	29.06
ATOM	4830	O	WAT	W	177	−17.506	35.918	−29.284	1.00	36.40
ATOM	4831	O	WAT	W	178	−18.298	7.055	−19.628	1.00	30.04
ATOM	4832	O	WAT	W	179	−24.383	14.811	−26.605	1.00	29.51
ATOM	4833	O	WAT	W	180	−1.204	27.462	−35.328	1.00	29.93
ATOM	4834	O	WAT	W	181	−14.112	33.822	−23.916	1.00	34.66
ATOM	4835	O	WAT	W	182	2.887	26.714	−9.619	1.00	34.18
ATOM	4836	O	WAT	W	183	−16.062	4.698	1.046	1.00	32.44
ATOM	4837	O	WAT	W	184	−13.340	36.111	−4.359	1.00	39.14
ATOM	4838	O	WAT	W	185	9.661	34.457	−47.977	1.00	37.66
ATOM	4839	O	WAT	W	186	−8.465	24.284	−1.237	1.00	33.71
ATOM	4840	O	WAT	W	187	16.971	15.520	−43.951	1.00	42.49
ATOM	4841	O	WAT	W	188	−12.038	−14.614	−20.299	1.00	34.37
ATOM	4842	O	WAT	W	189	−5.887	22.387	−40.784	1.00	33.70
ATOM	4843	O	WAT	W	190	−3.962	−18.100	−17.720	1.00	31.33
ATOM	4844	O	WAT	W	191	−30.888	11.643	−15.288	1.00	36.84
ATOM	4845	O	WAT	W	192	11.576	13.142	−37.752	1.00	32.89
ATOM	4846	O	WAT	W	193	−7.856	3.348	−41.927	1.00	34.02
ATOM	4847	O	WAT	W	194	−20.849	7.518	7.652	1.00	32.37
ATOM	4848	O	WAT	W	195	16.954	13.938	−58.514	1.00	42.65
ATOM	4849	O	WAT	W	196	−31.884	7.593	−13.893	1.00	37.54
ATOM	4850	O	WAT	W	197	4.560	−14.190	−17.137	1.00	36.09
ATOM	4851	O	WAT	W	198	1.116	27.617	−39.051	1.00	37.08
ATOM	4852	O	WAT	W	199	−1.019	−12.134	−21.800	1.00	36.12
ATOM	4853	O	WAT	W	200	8.350	0.111	−21.198	1.00	36.56
ATOM	4854	O	WAT	W	201	−2.691	31.235	−26.910	1.00	32.08
ATOM	4855	O	WAT	W	202	13.222	30.530	−38.626	1.00	36.46
ATOM	4856	O	WAT	W	203	−11.218	19.535	−54.549	1.00	35.12
ATOM	4857	O	WAT	W	204	−5.623	10.865	−46.910	1.00	35.48
ATOM	4858	O	WAT	W	205	−18.073	1.743	−43.946	1.00	40.62
ATOM	4859	O	WAT	W	206	−32.195	23.231	2.102	1.00	34.73
ATOM	4860	O	WAT	W	207	−24.204	8.994	−2.941	1.00	30.29
ATOM	4861	O	WAT	W	208	−4.771	18.292	−48.610	1.00	31.87
ATOM	4862	O	WAT	W	209	−17.156	23.843	−40.674	1.00	35.73
ATOM	4863	O	WAT	W	210	8.319	13.422	−13.297	1.00	37.43
ATOM	4864	O	WAT	W	211	−25.962	8.559	−33.791	1.00	33.46
ATOM	4865	O	WAT	W	212	−36.129	8.276	3.147	1.00	40.24
ATOM	4866	O	WAT	W	213	20.833	21.074	−56.185	1.00	39.11
ATOM	4867	O	WAT	W	214	−17.726	14.087	8.330	1.00	39.10
ATOM	4868	O	WAT	W	215	8.944	8.011	−10.493	1.00	41.24
ATOM	4869	O	WAT	W	216	−16.566	35.858	−11.282	1.00	38.90
ATOM	4870	O	WAT	W	217	−20.560	11.198	−43.128	1.00	34.83
ATOM	4871	O	WAT	W	218	3.261	−0.833	−39.177	1.00	32.67
ATOM	4872	O	WAT	W	219	−22.370	−13.152	−34.412	1.00	59.42
ATOM	4873	O	WAT	W	220	−24.775	6.925	5.968	1.00	34.28
ATOM	4874	O	WAT	W	221	−20.357	21.098	−45.702	1.00	36.83
ATOM	4875	O	WAT	W	222	2.502	28.932	−40.686	1.00	36.85
ATOM	4876	O	WAT	W	223	−17.630	−5.533	−21.334	1.00	35.08
ATOM	4877	O	WAT	W	224	−19.358	−1.912	−43.190	1.00	35.83
ATOM	4878	O	WAT	W	225	−14.632	25.995	−42.094	1.00	41.12

TABLE 15-continued

ATOM	4879	O	WAT	W	226	−28.967	5.606	−22.103	1.00	45.63
ATOM	4880	O	WAT	W	227	−4.326	9.934	5.097	1.00	44.46
ATOM	4881	O	WAT	W	228	3.983	22.711	−17.336	1.00	46.21
ATOM	4882	O	WAT	W	229	−17.238	16.931	6.949	1.00	42.44
ATOM	4883	O	WAT	W	230	−25.871	18.809	10.364	1.00	36.15
ATOM	4884	O	WAT	W	231	−23.524	31.294	−19.082	1.00	35.99
ATOM	4885	O	WAT	W	232	−5.261	−9.321	−38.277	1.00	43.42
ATOM	4886	O	WAT	W	233	−22.757	28.188	−29.173	1.00	39.56
ATOM	4887	O	WAT	W	234	−25.699	26.238	−0.299	1.00	40.26
ATOM	4888	O	WAT	W	235	−21.884	−4.007	−22.294	1.00	38.01
ATOM	4889	O	WAT	W	236	−6.696	−17.346	−27.753	1.00	39.83
ATOM	4890	O	WAT	W	237	−18.052	5.515	3.888	1.00	37.82
ATOM	4891	O	WAT	W	238	−6.073	35.708	−9.057	1.00	36.25
ATOM	4892	O	WAT	W	239	−8.876	2.984	−44.368	1.00	45.85
ATOM	4893	O	WAT	W	240	9.232	31.613	−65.496	1.00	45.82
ATOM	4894	O	WAT	W	241	−28.246	26.806	−0.118	1.00	36.45
ATOM	4895	O	WAT	W	242	−27.793	14.675	−45.312	1.00	52.10
ATOM	4896	O	WAT	W	243	7.463	14.079	−55.045	1.00	36.97
ATOM	4897	O	WAT	W	244	−28.572	4.769	−1.130	1.00	36.20
ATOM	4898	O	WAT	W	245	8.221	12.936	−50.870	1.00	38.81
ATOM	4899	O	WAT	W	246	−23.302	−2.082	−27.191	1.00	32.98
ATOM	4900	O	WAT	W	247	−13.035	8.248	−46.620	1.00	51.73
ATOM	4901	O	WAT	W	248	−11.869	31.852	−50.157	1.00	56.13
ATOM	4902	O	WAT	W	249	0.898	13.920	−6.521	1.00	27.38
ATOM	4903	O	WAT	W	250	20.427	30.852	−45.446	1.00	35.54
ATOM	4904	O	WAT	W	251	−1.397	12.400	−44.617	1.00	39.33
ATOM	4905	O	WAT	W	252	−27.354	24.696	−3.162	1.00	35.38
ATOM	4906	O	WAT	W	253	17.587	20.557	−31.069	1.00	41.51
ATOM	4907	O	WAT	W	254	−7.936	35.055	−7.354	1.00	39.02
ATOM	4908	O	WAT	W	255	−22.469	7.215	−2.044	1.00	38.25
ATOM	4909	O	WAT	W	256	2.038	15.474	−52.963	1.00	50.04
ATOM	4910	O	WAT	W	257	10.889	10.184	−21.700	1.00	44.84
ATOM	4911	O	WAT	W	258	−11.714	10.583	4.136	1.00	42.70
ATOM	4912	O	WAT	W	259	−14.719	6.574	2.959	1.00	43.18
ATOM	4913	O	WAT	W	260	−16.694	25.390	−37.688	1.00	36.77
ATOM	4914	O	WAT	W	261	−9.212	13.388	−48.363	1.00	38.05
ATOM	4915	O	WAT	W	264	−0.611	−1.965	−3.253	1.00	37.95
ATOM	4916	O	WAT	W	265	−16.380	30.998	−14.262	1.00	32.44
ATOM	4917	O	WAT	W	266	9.420	16.012	−61.368	1.00	35.22
ATOM	4918	O	WAT	W	267	−4.976	−15.180	−21.223	1.00	45.50
ATOM	4919	O	WAT	W	268	−16.631	33.287	−14.201	1.00	34.50
ATOM	4920	O	WAT	W	269	−16.883	34.052	−32.249	1.00	36.88
ATOM	4921	O	WAT	W	270	−8.293	−16.006	−14.535	1.00	34.80
ATOM	4922	O	WAT	W	273	0.240	4.589	−13.868	1.00	32.34
ATOM	4923	O	WAT	W	275	3.657	14.447	−55.516	1.00	43.54
ATOM	4924	O	WAT	W	276	−17.602	20.784	−51.471	1.00	38.88
ATOM	4925	O	WAT	W	277	−10.479	31.683	−30.513	1.00	40.35
ATOM	4926	O	WAT	W	278	−10.974	4.308	−5.745	1.00	40.30
ATOM	4927	O	WAT	W	280	−4.336	36.908	−17.666	1.00	34.01
ATOM	4928	O	WAT	W	281	6.720	33.970	−53.572	1.00	38.81
ATOM	4929	O	WAT	W	282	−30.457	23.527	−0.621	1.00	34.61
ATOM	4930	O	WAT	W	283	16.969	17.394	−30.816	1.00	55.74
ATOM	4931	O	WAT	W	284	−24.391	5.834	−24.909	1.00	37.92
ATOM	4932	O	WAT	W	285	4.567	9.814	−4.438	1.00	44.83
ATOM	4933	O	WAT	W	286	−24.370	−7.328	−27.875	1.00	56.18
ATOM	4934	O	WAT	W	287	−21.605	11.887	9.715	1.00	43.15
ATOM	4935	O	WAT	W	288	8.603	0.412	−37.887	1.00	40.47
ATOM	4936	O	WAT	W	290	−20.056	21.495	6.073	1.00	41.68
ATOM	4937	O	WAT	W	291	−3.221	28.158	−33.448	1.00	44.24
ATOM	4938	O	WAT	W	292	9.171	9.103	−38.735	1.00	34.30
ATOM	4939	O	WAT	W	293	2.894	22.763	−25.829	1.00	38.57
ATOM	4940	O	WAT	W	294	−29.901	19.604	−14.929	1.00	37.66
ATOM	4941	O	WAT	W	296	−4.579	30.229	−29.110	1.00	40.57
ATOM	4942	O	WAT	W	297	−23.821	11.441	−33.187	1.00	42.81
ATOM	4943	O	WAT	W	298	−26.753	−3.087	−31.243	1.00	39.08
ATOM	4944	O	WAT	W	300	−10.820	35.024	−53.050	1.00	55.39
ATOM	4945	O	WAT	W	302	−1.992	7.169	−31.692	1.00	39.12
ATOM	4946	O	WAT	W	303	−15.282	−19.000	−23.770	1.00	34.62
ATOM	4947	O	WAT	W	304	12.106	10.568	−25.112	1.00	39.04
ATOM	4948	O	WAT	W	305	2.585	2.766	1.880	1.00	53.88
ATOM	4949	O	WAT	W	306	3.680	21.122	−19.818	1.00	46.35
ATOM	4950	O	WAT	W	307	22.759	24.721	−48.099	1.00	40.35
ATOM	4951	O	WAT	W	309	−17.062	−6.726	−19.202	1.00	41.54
ATOM	4952	O	WAT	W	311	12.594	1.109	−31.461	1.00	47.85
ATOM	4953	O	WAT	W	312	23.347	25.060	−50.638	1.00	49.64
ATOM	4954	O	WAT	W	314	−18.291	4.422	−19.151	1.00	39.17
ATOM	4955	O	WAT	W	315	−11.815	−7.807	−8.676	1.00	37.74
ATOM	4956	O	WAT	W	316	−25.147	1.885	−4.649	1.00	44.72
ATOM	4957	O	WAT	W	317	−36.473	13.592	5.315	1.00	44.38
ATOM	4958	O	WAT	W	318	−17.587	20.023	−46.231	1.00	48.30

TABLE 15-continued

ATOM	4959	O	WAT	W	319	−16.081	29.024	−54.668	1.00	39.40
ATOM	4960	O	WAT	W	320	−14.210	32.143	−5.494	1.00	42.73
ATOM	4961	O	WAT	W	321	−15.274	28.830	−38.916	1.00	46.47
ATOM	4962	O	WAT	W	322	−32.792	22.221	−3.433	1.00	41.52
ATOM	4963	O	WAT	W	323	−32.475	16.905	−12.401	1.00	46.29
ATOM	4964	O	WAT	W	325	15.341	22.212	−60.490	1.00	34.67
ATOM	4965	O	WAT	W	326	−12.668	8.518	−41.723	1.00	36.26
ATOM	4966	O	WAT	W	327	4.709	20.490	−10.568	1.00	38.04
ATOM	4967	O	WAT	W	328	13.937	10.625	−29.312	1.00	38.32
ATOM	4968	O	WAT	W	329	−21.964	9.615	−24.896	1.00	40.43
ATOM	4969	O	WAT	W	330	19.325	25.925	−40.199	1.00	51.36
ATOM	4970	O	WAT	W	331	−19.010	8.073	−45.255	1.00	46.06
ATOM	4971	O	WAT	W	332	−25.024	−2.892	−29.306	1.00	41.74
ATOM	4972	O	WAT	W	333	−16.593	−7.067	−23.297	1.00	38.54
ATOM	4973	O	WAT	W	334	−17.517	24.078	2.157	1.00	45.82
ATOM	4974	O	WAT	W	335	−19.123	31.941	0.010	1.00	38.91
ATOM	4975	O	WAT	W	337	10.677	21.901	−62.740	1.00	44.31
ATOM	4976	O	WAT	W	338	4.510	15.230	−51.810	1.00	42.12
ATOM	4977	O	WAT	W	339	13.979	14.161	−43.380	1.00	46.42
ATOM	4978	O	WAT	W	341	5.979	−11.625	−28.739	1.00	43.09
ATOM	4979	O	WAT	W	342	−19.453	13.347	10.394	1.00	42.44
ATOM	4980	O	WAT	W	343	7.085	23.050	−30.796	1.00	34.94
ATOM	4981	O	WAT	W	345	6.471	24.087	−63.943	1.00	45.16
ATOM	4982	O	WAT	W	347	3.734	22.842	−12.031	1.00	43.85
ATOM	4983	O	WAT	W	348	−17.739	7.564	5.723	1.00	43.77
ATOM	4984	O	WAT	W	351	−22.014	31.372	−24.708	1.00	42.69
ATOM	4985	O	WAT	W	352	25.016	25.103	−46.967	1.00	40.51
ATOM	4986	O	WAT	W	353	7.969	32.464	−67.637	1.00	57.78
ATOM	4987	O	WAT	W	354	−27.444	5.101	5.861	1.00	48.31
ATOM	4988	O	WAT	W	356	8.012	11.087	−40.867	1.00	47.51
ATOM	4989	O	WAT	W	357	4.974	29.116	−17.433	1.00	43.72
ATOM	4990	O	WAT	W	358	−0.457	9.488	−45.288	1.00	45.63
ATOM	4991	O	WAT	W	360	−3.090	36.536	−12.138	1.00	46.29
ATOM	4992	O	WAT	W	361	20.072	19.772	−36.896	1.00	38.73
ATOM	4993	O	WAT	W	363	−26.217	15.345	−28.735	1.00	49.07
ATOM	4994	O	WAT	W	365	−25.308	0.100	−48.602	1.00	60.01
ATOM	4995	O	WAT	W	367	19.369	29.586	−58.438	1.00	48.19
ATOM	4996	O	WAT	W	369	12.808	11.144	−54.427	1.00	48.48
ATOM	4997	O	WAT	W	370	9.410	2.674	−16.115	1.00	44.59
ATOM	4998	O	WAT	W	372	−10.249	38.564	−13.215	1.00	48.60
ATOM	4999	O	WAT	W	373	−24.151	16.211	10.617	1.00	42.16
ATOM	5000	O	WAT	W	375	−6.459	31.697	−48.106	1.00	46.03
ATOM	5001	O	WAT	W	376	−11.605	27.116	−1.562	1.00	44.58
ATOM	5002	O	WAT	W	377	−4.703	24.150	−62.673	1.00	48.70
ATOM	5003	O	WAT	W	379	6.889	0.036	−7.530	1.00	45.35
ATOM	5004	O	WAT	W	381	−13.601	32.742	−32.002	1.00	51.37
ATOM	5005	O	WAT	W	383	−28.077	5.243	−4.688	1.00	37.46
END										

SEQUENCE LISTING

<160> NUMBER OF SEQ ID NOS: 160

<210> SEQ ID NO 1
<211> LENGTH: 632
<212> TYPE: PRT
<213> ORGANISM: Trichoderma reesei

<400> SEQUENCE: 1

```
Met His Val Leu Ser Thr Ala Val Leu Leu Gly Ser Val Ala Val Gln
1               5                  10                  15

Lys Val Leu Gly Arg Pro Gly Ser Ser Gly Leu Ser Asp Val Thr Lys
            20                  25                  30

Arg Ser Val Asp Asp Phe Ile Ser Thr Glu Thr Pro Ile Ala Leu Asn
        35                  40                  45

Asn Leu Leu Cys Asn Val Gly Pro Asp Gly Cys Arg Ala Phe Gly Thr
    50                  55                  60

Ser Ala Gly Ala Val Ile Ala Ser Pro Ser Thr Ile Asp Pro Asp Tyr
65                  70                  75                  80
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Tyr Tyr Met Trp Thr Arg Asp Ser Ala Leu Val Phe Lys Asn Leu Ile
                85                  90                  95

Asp Arg Phe Thr Glu Thr Tyr Asp Ala Gly Leu Gln Arg Arg Ile Glu
            100                 105                 110

Gln Tyr Ile Thr Ala Gln Val Thr Leu Gln Gly Leu Ser Asn Pro Ser
        115                 120                 125

Gly Ser Leu Ala Asp Gly Ser Gly Leu Gly Glu Pro Lys Phe Glu Leu
    130                 135                 140

Thr Leu Lys Pro Phe Thr Gly Asn Trp Gly Arg Pro Gln Arg Asp Gly
145                 150                 155                 160

Pro Ala Leu Arg Ala Ile Ala Leu Ile Gly Tyr Ser Lys Trp Leu Ile
                165                 170                 175

Asn Asn Asn Tyr Gln Ser Thr Val Ser Asn Val Ile Trp Pro Ile Val
            180                 185                 190

Arg Asn Asp Leu Asn Tyr Val Ala Gln Tyr Trp Asn Gln Thr Gly Phe
        195                 200                 205

Asp Leu Trp Glu Glu Val Asn Gly Ser Ser Phe Phe Thr Val Ala Asn
    210                 215                 220

Gln His Arg Ala Leu Val Glu Gly Ala Thr Leu Ala Ala Thr Leu Gly
225                 230                 235                 240

Gln Ser Gly Ser Ala Tyr Ser Ser Val Ala Pro Gln Val Leu Cys Phe
                245                 250                 255

Leu Gln Arg Phe Trp Val Ser Ser Gly Gly Tyr Val Asp Ser Asn Ile
            260                 265                 270

Asn Thr Asn Glu Gly Arg Thr Gly Lys Asp Val Asn Ser Val Leu Thr
        275                 280                 285

Ser Ile His Thr Phe Asp Pro Asn Leu Gly Cys Asp Ala Gly Thr Phe
    290                 295                 300

Gln Pro Cys Ser Asp Lys Ala Leu Ser Asn Leu Lys Val Val Val Asp
305                 310                 315                 320

Ser Phe Arg Ser Ile Tyr Gly Val Asn Lys Gly Ile Pro Ala Gly Ala
                325                 330                 335

Ala Val Ala Ile Gly Arg Tyr Ala Glu Asp Val Tyr Tyr Asn Gly Asn
            340                 345                 350

Pro Trp Tyr Leu Ala Thr Phe Ala Ala Ala Glu Gln Leu Tyr Asp Ala
        355                 360                 365

Ile Tyr Val Trp Lys Lys Thr Gly Ser Ile Thr Val Thr Ala Thr Ser
    370                 375                 380

Leu Ala Phe Phe Gln Glu Leu Val Pro Gly Val Thr Ala Gly Thr Tyr
385                 390                 395                 400

Ser Ser Ser Ser Ser Thr Phe Thr Asn Ile Ile Asn Ala Val Ser Thr
                405                 410                 415

Tyr Ala Asp Gly Phe Leu Ser Glu Ala Ala Lys Tyr Val Pro Ala Asp
            420                 425                 430

Gly Ser Leu Ala Glu Gln Phe Asp Arg Asn Ser Gly Thr Pro Leu Ser
        435                 440                 445

Ala Leu His Leu Thr Trp Ser Tyr Ala Ser Phe Leu Thr Ala Thr Ala
    450                 455                 460

Arg Arg Ala Gly Ile Val Pro Pro Ser Trp Ala Asn Ser Ser Ala Ser
465                 470                 475                 480

Thr Ile Pro Ser Thr Cys Ser Gly Ala Ser Val Val Gly Ser Tyr Ser
                485                 490                 495
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Arg Pro Thr Ala Thr Ser Phe Pro Pro Ser Gln Thr Pro Lys Pro Gly
            500                 505                 510

Val Pro Ser Gly Thr Pro Tyr Thr Pro Leu Pro Cys Ala Thr Pro Thr
        515                 520                 525

Ser Val Ala Val Thr Phe His Glu Leu Val Ser Thr Gln Phe Gly Gln
    530                 535                 540

Thr Val Lys Val Ala Gly Asn Ala Ala Ala Leu Gly Asn Trp Ser Thr
545                 550                 555                 560

Ser Ala Ala Val Ala Leu Asp Ala Val Asn Tyr Ala Asp Asn His Pro
                565                 570                 575

Leu Trp Ile Gly Thr Val Asn Leu Glu Ala Gly Asp Val Val Glu Tyr
            580                 585                 590

Lys Tyr Ile Asn Val Gly Gln Asp Gly Ser Val Thr Trp Glu Ser Asp
        595                 600                 605

Pro Asn His Thr Tyr Thr Val Pro Ala Val Ala Cys Val Thr Gln Val
    610                 615                 620

Val Lys Glu Asp Thr Trp Gln Ser
625                 630


<210> SEQ ID NO 2
<211> LENGTH: 599
<212> TYPE: PRT
<213> ORGANISM: Trichoderma reesei

<400> SEQUENCE: 2

Ser Val Asp Asp Phe Ile Ser Thr Glu Thr Pro Ile Ala Leu Asn Asn
1               5                   10                  15

Leu Leu Cys Asn Val Gly Pro Asp Gly Cys Arg Ala Phe Gly Thr Ser
            20                  25                  30

Ala Gly Ala Val Ile Ala Ser Pro Ser Thr Ile Asp Pro Asp Tyr Tyr
        35                  40                  45

Tyr Met Trp Thr Arg Asp Ser Ala Leu Val Phe Lys Asn Leu Ile Asp
    50                  55                  60

Arg Phe Thr Glu Thr Tyr Asp Ala Gly Leu Gln Arg Arg Ile Glu Gln
65                  70                  75                  80

Tyr Ile Thr Ala Gln Val Thr Leu Gln Gly Leu Ser Asn Pro Ser Gly
                85                  90                  95

Ser Leu Ala Asp Gly Ser Gly Leu Gly Glu Pro Lys Phe Glu Leu Thr
            100                 105                 110

Leu Lys Pro Phe Thr Gly Asn Trp Gly Arg Pro Gln Arg Asp Gly Pro
        115                 120                 125

Ala Leu Arg Ala Ile Ala Leu Ile Gly Tyr Ser Lys Trp Leu Ile Asn
    130                 135                 140

Asn Asn Tyr Gln Ser Thr Val Ser Asn Val Ile Trp Pro Ile Val Arg
145                 150                 155                 160

Asn Asp Leu Asn Tyr Val Ala Gln Tyr Trp Asn Gln Thr Gly Phe Asp
                165                 170                 175

Leu Trp Glu Glu Val Asn Gly Ser Ser Phe Phe Thr Val Ala Asn Gln
            180                 185                 190

His Arg Ala Leu Val Glu Gly Ala Thr Leu Ala Ala Thr Leu Gly Gln
        195                 200                 205

Ser Gly Ser Ala Tyr Ser Ser Val Ala Pro Gln Val Leu Cys Phe Leu
    210                 215                 220

Gln Arg Phe Trp Val Ser Ser Gly Gly Tyr Val Asp Ser Asn Ile Asn
225                 230                 235                 240
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Thr Asn Glu Gly Arg Thr Gly Lys Asp Val Asn Ser Val Leu Thr Ser
                245                 250                 255

Ile His Thr Phe Asp Pro Asn Leu Gly Cys Asp Ala Gly Thr Phe Gln
            260                 265                 270

Pro Cys Ser Asp Lys Ala Leu Ser Asn Leu Lys Val Val Val Asp Ser
        275                 280                 285

Phe Arg Ser Ile Tyr Gly Val Asn Lys Gly Ile Pro Ala Gly Ala Ala
    290                 295                 300

Val Ala Ile Gly Arg Tyr Ala Glu Asp Val Tyr Tyr Asn Gly Asn Pro
305                 310                 315                 320

Trp Tyr Leu Ala Thr Phe Ala Ala Ala Glu Gln Leu Tyr Asp Ala Ile
                325                 330                 335

Tyr Val Trp Lys Lys Thr Gly Ser Ile Thr Val Thr Ala Thr Ser Leu
            340                 345                 350

Ala Phe Phe Gln Glu Leu Val Pro Gly Val Thr Ala Gly Thr Tyr Ser
        355                 360                 365

Ser Ser Ser Ser Thr Phe Thr Asn Ile Ile Asn Ala Val Ser Thr Tyr
    370                 375                 380

Ala Asp Gly Phe Leu Ser Glu Ala Ala Lys Tyr Val Pro Ala Asp Gly
385                 390                 395                 400

Ser Leu Ala Glu Gln Phe Asp Arg Asn Ser Gly Thr Pro Leu Ser Ala
                405                 410                 415

Leu His Leu Thr Trp Ser Tyr Ala Ser Phe Leu Thr Ala Thr Ala Arg
            420                 425                 430

Arg Ala Gly Ile Val Pro Pro Ser Trp Ala Asn Ser Ser Ala Ser Thr
        435                 440                 445

Ile Pro Ser Thr Cys Ser Gly Ala Ser Val Val Gly Ser Tyr Ser Arg
    450                 455                 460

Pro Thr Ala Thr Ser Phe Pro Pro Ser Gln Thr Pro Lys Pro Gly Val
465                 470                 475                 480

Pro Ser Gly Thr Pro Tyr Thr Pro Leu Pro Cys Ala Thr Pro Thr Ser
                485                 490                 495

Val Ala Val Thr Phe His Glu Leu Val Ser Thr Gln Phe Gly Gln Thr
            500                 505                 510

Val Lys Val Ala Gly Asn Ala Ala Ala Leu Gly Asn Trp Ser Thr Ser
        515                 520                 525

Ala Ala Val Ala Leu Asp Ala Val Asn Tyr Ala Asp Asn His Pro Leu
    530                 535                 540

Trp Ile Gly Thr Val Asn Leu Glu Ala Gly Asp Val Val Glu Tyr Lys
545                 550                 555                 560

Tyr Ile Asn Val Gly Gln Asp Gly Ser Val Thr Trp Glu Ser Asp Pro
                565                 570                 575

Asn His Thr Tyr Thr Val Pro Ala Val Ala Cys Val Thr Gln Val Val
            580                 585                 590

Lys Glu Asp Thr Trp Gln Ser
        595


<210> SEQ ID NO 3
<211> LENGTH: 453
<212> TYPE: PRT
<213> ORGANISM: Trichoderma reesei

<400> SEQUENCE: 3

Ser Val Asp Asp Phe Ile Ser Thr Glu Thr Pro Ile Ala Leu Asn Asn
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1               5                   10                  15

Leu Leu Cys Asn Val Gly Pro Asp Gly Cys Arg Ala Phe Gly Thr Ser
            20                  25                  30

Ala Gly Ala Val Ile Ala Ser Pro Ser Thr Ile Asp Pro Asp Tyr Tyr
        35                  40                  45

Tyr Met Trp Thr Arg Asp Ser Ala Leu Val Phe Lys Asn Leu Ile Asp
    50                  55                  60

Arg Phe Thr Glu Thr Tyr Asp Ala Gly Leu Gln Arg Arg Ile Glu Gln
65                  70                  75                  80

Tyr Ile Thr Ala Gln Val Thr Leu Gln Gly Leu Ser Asn Pro Ser Gly
                85                  90                  95

Ser Leu Ala Asp Gly Ser Gly Leu Gly Glu Pro Lys Phe Glu Leu Thr
            100                 105                 110

Leu Lys Pro Phe Thr Gly Asn Trp Gly Arg Pro Gln Arg Asp Gly Pro
        115                 120                 125

Ala Leu Arg Ala Ile Ala Leu Ile Gly Tyr Ser Lys Trp Leu Ile Asn
    130                 135                 140

Asn Asn Tyr Gln Ser Thr Val Ser Asn Val Ile Trp Pro Ile Val Arg
145                 150                 155                 160

Asn Asp Leu Asn Tyr Val Ala Gln Tyr Trp Asn Gln Thr Gly Phe Asp
                165                 170                 175

Leu Trp Glu Glu Val Asn Gly Ser Ser Phe Phe Thr Val Ala Asn Gln
            180                 185                 190

His Arg Ala Leu Val Glu Gly Ala Thr Leu Ala Ala Thr Leu Gly Gln
        195                 200                 205

Ser Gly Ser Ala Tyr Ser Ser Val Ala Pro Gln Val Leu Cys Phe Leu
    210                 215                 220

Gln Arg Phe Trp Val Ser Ser Gly Gly Tyr Val Asp Ser Asn Ile Asn
225                 230                 235                 240

Thr Asn Glu Gly Arg Thr Gly Lys Asp Val Asn Ser Val Leu Thr Ser
                245                 250                 255

Ile His Thr Phe Asp Pro Asn Leu Gly Cys Asp Ala Gly Thr Phe Gln
            260                 265                 270

Pro Cys Ser Asp Lys Ala Leu Ser Asn Leu Lys Val Val Val Asp Ser
        275                 280                 285

Phe Arg Ser Ile Tyr Gly Val Asn Lys Gly Ile Pro Ala Gly Ala Ala
    290                 295                 300

Val Ala Ile Gly Arg Tyr Ala Glu Asp Val Tyr Tyr Asn Gly Asn Pro
305                 310                 315                 320

Trp Tyr Leu Ala Thr Phe Ala Ala Ala Glu Gln Leu Tyr Asp Ala Ile
                325                 330                 335

Tyr Val Trp Lys Lys Thr Gly Ser Ile Thr Val Thr Ala Thr Ser Leu
            340                 345                 350

Ala Phe Phe Gln Glu Leu Val Pro Gly Val Thr Ala Gly Thr Tyr Ser
        355                 360                 365

Ser Ser Ser Ser Thr Phe Thr Asn Ile Ile Asn Ala Val Ser Thr Tyr
    370                 375                 380

Ala Asp Gly Phe Leu Ser Glu Ala Ala Lys Tyr Val Pro Ala Asp Gly
385                 390                 395                 400

Ser Leu Ala Glu Gln Phe Asp Arg Asn Ser Gly Thr Pro Leu Ser Ala
                405                 410                 415

Leu His Leu Thr Trp Ser Tyr Ala Ser Phe Leu Thr Ala Thr Ala Arg
            420                 425                 430
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```
Arg Ala Gly Ile Val Pro Pro Ser Trp Ala Asn Ser Ser Ala Ser Thr
        435                 440                 445

Ile Pro Ser Thr Cys
    450
```

<210> SEQ ID NO 4
<211> LENGTH: 1899
<212> TYPE: DNA
<213> ORGANISM: Trichoderma reesei

<400> SEQUENCE: 4

```
atgcacgtcc tgtcgactgc ggtgctgctc ggctccgttg ccgttcaaaa ggtcctggga     60

agaccaggat caagcggtct gtccgacgtc accaagaggt ctgttgacga cttcatcagc    120

accgagacgc ctattgcact gaacaatctt ctttgcaatg ttggtcctga tggatgccgt    180

gcattcggca catcagctgg tgcggtgatt gcatctccca gcacaattga cccggactac    240

tattacatgt ggacgcgaga tagcgctctt gtcttcaaga acctcatcga ccgcttcacc    300

gaaacgtacg atgcgggcct gcagcgccgc atcgagcagt acattactgc ccaggtcact    360

ctccagggcc tctctaaccc ctcgggctcc ctcgcggacg gctctggtct cggcgagccc    420

aagtttgagt tgaccctgaa gcctttcacc ggcaactggg gtcgaccgca gcgggatggc    480

ccagctctgc gagccattgc cttgattgga tactcaaagt ggctcatcaa caacaactat    540

cagtcgactg tgtccaacgt catctggcct attgtgcgca acgacctcaa ctatgttgcc    600

cagtactgga accaaaccgg ctttgacctc tgggaagaag tcaatgggag ctcattcttt    660

actgttgcca accagcaccg agcacttgtc gagggcgcca ctcttgctgc cactcttggc    720

cagtcgggaa gcgcttattc atctgttgct ccccaggttt tgtgctttct ccaacgattc    780

tgggtgtcgt ctggtggata cgtcgactcc aacatcaaca ccaacgaggg caggactggc    840

aaggatgtca actccgtcct gacttccatc cacaccttcg atcccaacct tggctgtgac    900

gcaggcacct tccagccatg cagtgacaaa gcgctctcca acctcaaggt tgttgtcgac    960

tccttccgct ccatctacgg cgtgaacaag ggcattcctg ccggtgctgc cgtcgccatt   1020

ggccggtatg cagaggatgt gtactacaac ggcaaccctt ggtatcttgc tacatttgct   1080

gctgccgagc agctgtacga tgccatctac gtctggaaga agacgggctc catcacggtg   1140

accgccacct ccctggcctt cttccaggag cttgttcctg gcgtgacggc cgggacctac   1200

tccagcagct cttcgacctt taccaacatc atcaacgccg tctcgacata cgccgatggc   1260

ttcctcagcg aggctgccaa gtacgtcccc gccgacggtt cgctggccga gcagtttgac   1320

cgcaacagcg gcactccgct gtctgcgctt cacctgacgt ggtcgtacgc ctcgttcttg   1380

acagccacgg cccgtcgggc tggcatcgtg ccccccctcgt gggccaacag cagcgctagc   1440

acgatcccct cgacgtgctc cggcgcgtcc gtggtcggat cctactcgcg tcccaccgcc   1500

acgtcattcc ctccgtcgca gacgcccaag cctggcgtgc cttccggtac tccctacacg   1560

cccctgccct gcgcgacccc aacctccgtg gccgtcacct tccacgagct cgtgtcgaca   1620

cagtttggcc agacggtcaa ggtggcgggc aacgccgcgg ccctgggcaa ctggagcacg   1680

agcgccgccg tggctctgga cgccgtcaac tatgccgata accacccccct gtggattggg   1740

acggtcaacc tcgaggctgg agacgtcgtg gagtacaagt acatcaatgt gggccaagat   1800

ggctccgtga cctgggagag tgatcccaac cacacttaca cggttcctgc ggtggcttgt   1860

gtgacgcagg ttgtcaagga ggacacctgg cagtcgtaa                           1899
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<210> SEQ ID NO 5
<211> LENGTH: 448
<212> TYPE: PRT
<213> ORGANISM: Aspergillus awamori

<400> SEQUENCE: 5

Ala Thr Leu Asp Ser Trp Leu Ser Asn Glu Ala Thr Val Ala Arg Thr
1 5 10 15

Ala Ile Leu Asn Asn Ile Gly Ala Asp Gly Ala Trp Val Ser Gly Ala
20 25 30

Asp Ser Gly Ile Val Val Ala Ser Pro Ser Thr Asp Asn Pro Asp Tyr
35 40 45

Phe Tyr Thr Trp Thr Arg Asp Ser Gly Leu Val Ile Lys Thr Leu Val
50 55 60

Asp Leu Phe Arg Asn Gly Asp Thr Asp Leu Leu Ser Thr Ile Glu Asn
65 70 75 80

Tyr Ile Ser Ser Gln Ala Ile Val Gln Gly Ile Ser Asn Pro Ser Gly
85 90 95

Asp Leu Ser Ser Gly Gly Leu Gly Glu Pro Lys Phe Asn Val Asp Glu
100 105 110

Thr Ala Tyr Thr Gly Ser Trp Gly Arg Pro Gln Arg Asp Gly Pro Ala
115 120 125

Leu Arg Ala Thr Ala Met Ile Gly Phe Arg Gln Trp Leu Leu Asp Asn
130 135 140

Gly Tyr Thr Ser Ala Ala Thr Glu Ile Val Trp Pro Leu Val Arg Asn
145 150 155 160

Asp Leu Ser Tyr Val Ala Gln Tyr Trp Asn Gln Thr Gly Tyr Asp Leu
165 170 175

Trp Glu Glu Val Asn Gly Ser Ser Phe Phe Thr Ile Ala Val Gln His
180 185 190

Arg Ala Leu Val Glu Gly Ser Ala Phe Ala Thr Ala Val Gly Ser Ser
195 200 205

Cys Ser Trp Cys Asp Ser Gln Ala Pro Gln Ile Leu Cys Tyr Leu Gln
210 215 220

Ser Phe Trp Thr Gly Glu Tyr Ile Leu Ala Asn Phe Asp Ser Ser Arg
225 230 235 240

Ser Gly Lys Asp Thr Asn Thr Leu Leu Gly Ser Ile His Thr Phe Asp
245 250 255

Pro Glu Ala Gly Cys Asp Asp Ser Thr Phe Gln Pro Cys Ser Pro Arg
260 265 270

Ala Leu Ala Asn His Lys Glu Val Val Asp Ser Phe Arg Ser Ile Tyr
275 280 285

Thr Leu Asn Asp Gly Leu Ser Asp Ser Glu Ala Val Ala Val Gly Arg
290 295 300

Tyr Pro Lys Asp Ser Tyr Tyr Asn Gly Asn Pro Trp Phe Leu Cys Thr
305 310 315 320

Leu Ala Ala Ala Glu Gln Leu Tyr Asp Ala Leu Tyr Gln Trp Asp Lys
325 330 335

Gln Gly Ser Leu Glu Ile Thr Asp Val Ser Leu Asp Phe Phe Gln Ala
340 345 350

Leu Tyr Ser Asp Ala Ala Thr Gly Thr Tyr Ser Ser Ser Ser Ser Thr
355 360 365

Tyr Ser Ser Ile Val Asp Ala Val Lys Thr Phe Ala Asp Gly Phe Val
370 375 380

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Ser Ile Val Glu Thr His Ala Ala Ser Asn Gly Ser Leu Ser Glu Gln
385                 390                 395                 400

Tyr Asp Lys Ser Asp Gly Asp Glu Leu Ser Ala Arg Asp Leu Thr Trp
                405                 410                 415

Ser Tyr Ala Ala Leu Leu Thr Ala Asn Asn Arg Arg Asn Ser Val Met
            420                 425                 430

Pro Pro Ser Trp Gly Glu Thr Ser Ala Ser Ser Val Pro Gly Thr Cys
        435                 440                 445


<210> SEQ ID NO 6
<211> LENGTH: 449
<212> TYPE: PRT
<213> ORGANISM: Aspergillus niger

<400> SEQUENCE: 6

Ala Thr Leu Asp Ser Trp Leu Ser Asn Glu Ala Thr Val Ala Arg Thr
1               5                   10                  15

Ala Ile Leu Asn Asn Ile Gly Ala Asp Gly Ala Trp Val Ser Gly Ala
            20                  25                  30

Asp Ser Gly Ile Val Val Ala Ser Pro Ser Thr Asp Asn Pro Asp Tyr
        35                  40                  45

Phe Tyr Thr Trp Thr Arg Asp Ser Gly Leu Val Leu Lys Thr Leu Val
    50                  55                  60

Asp Leu Phe Arg Asn Gly Asp Thr Ser Leu Leu Ser Thr Ile Glu Asn
65                  70                  75                  80

Tyr Ile Ser Ala Gln Ala Ile Val Gln Gly Ile Ser Asn Pro Ser Gly
                85                  90                  95

Asp Leu Ser Ser Gly Ala Gly Leu Gly Glu Pro Lys Phe Asn Val Asp
            100                 105                 110

Glu Thr Ala Tyr Thr Gly Ser Trp Gly Arg Pro Gln Arg Asp Gly Pro
        115                 120                 125

Ala Leu Arg Ala Thr Ala Met Ile Gly Phe Gly Gln Trp Leu Leu Asp
    130                 135                 140

Asn Gly Tyr Thr Ser Thr Ala Thr Asp Ile Val Trp Pro Leu Val Arg
145                 150                 155                 160

Asn Asp Leu Ser Tyr Val Ala Gln Tyr Trp Asn Gln Thr Gly Tyr Asp
                165                 170                 175

Leu Trp Glu Glu Val Asn Gly Ser Ser Phe Phe Thr Ile Ala Val Gln
            180                 185                 190

His Arg Ala Leu Val Glu Gly Ser Ala Phe Ala Thr Ala Val Gly Ser
        195                 200                 205

Ser Cys Ser Trp Cys Asp Ser Gln Ala Pro Glu Ile Leu Cys Tyr Leu
    210                 215                 220

Gln Ser Phe Trp Thr Gly Ser Phe Ile Leu Ala Asn Phe Asp Ser Ser
225                 230                 235                 240

Arg Ser Gly Lys Asp Ala Asn Thr Leu Leu Gly Ser Ile His Thr Phe
                245                 250                 255

Asp Pro Glu Ala Ala Cys Asp Asp Ser Thr Phe Gln Pro Cys Ser Pro
            260                 265                 270

Arg Ala Leu Ala Asn His Lys Glu Val Val Asp Ser Phe Arg Ser Ile
        275                 280                 285

Tyr Thr Leu Asn Asp Gly Leu Ser Asp Ser Glu Ala Val Ala Val Gly
    290                 295                 300

Arg Tyr Pro Glu Asp Thr Tyr Tyr Asn Gly Asn Pro Trp Phe Leu Cys
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305                 310                 315                 320

Thr Leu Ala Ala Ala Glu Gln Leu Tyr Asp Ala Leu Tyr Gln Trp Asp
                325                 330                 335

Lys Gln Gly Ser Leu Glu Val Thr Asp Val Ser Leu Asp Phe Phe Lys
            340                 345                 350

Ala Leu Tyr Ser Asp Ala Ala Thr Gly Thr Tyr Ser Ser Ser Ser Ser
        355                 360                 365

Thr Tyr Ser Ser Ile Val Asp Ala Val Lys Thr Phe Ala Asp Gly Phe
    370                 375                 380

Val Ser Ile Val Glu Thr His Ala Ala Ser Asn Gly Ser Met Ser Glu
385                 390                 395                 400

Gln Tyr Asp Lys Ser Asp Gly Glu Gln Leu Ser Ala Arg Asp Leu Thr
                405                 410                 415

Trp Ser Tyr Ala Ala Leu Leu Thr Ala Asn Asn Arg Arg Asn Ser Val
            420                 425                 430

Val Pro Ala Ser Trp Gly Glu Thr Ser Ala Ser Ser Val Pro Gly Thr
        435                 440                 445

Cys


<210> SEQ ID NO 7
<211> LENGTH: 450
<212> TYPE: PRT
<213> ORGANISM: Aspergillus orzyae

<400> SEQUENCE: 7

Gln Ser Asp Leu Asn Ala Phe Ile Glu Ala Gln Thr Pro Ile Ala Lys
1               5                   10                  15

Gln Gly Tyr Leu Asn Asn Ile Gly Ala Asp Gly Lys Leu Val Glu Gly
            20                  25                  30

Ala Ala Ala Gly Ile Val Tyr Ala Ser Pro Ser Lys Ser Asn Pro Asp
        35                  40                  45

Tyr Phe Tyr Thr Trp Thr Arg Asp Ala Gly Leu Thr Met Glu Glu Tyr
    50                  55                  60

Ile Glu Gln Phe Ile Gly Gly Asp Ala Thr Leu Glu Ser Thr Ile Gln
65                  70                  75                  80

Asn Tyr Val Asp Ser Gln Ala Asn Glu Gln Ala Val Ser Asn Pro Ser
                85                  90                  95

Gly Gly Leu Ser Asp Gly Ser Gly Leu Ala Glu Pro Lys Phe Tyr Tyr
            100                 105                 110

Asn Ile Ser Gln Phe Thr Asp Ser Trp Gly Arg Pro Gln Arg Asp Gly
        115                 120                 125

Pro Ala Leu Arg Ala Ser Ala Leu Ile Ala Tyr Gly Asn Ser Leu Ile
    130                 135                 140

Ser Ser Asp Lys Gln Ser Val Val Lys Ala Asn Ile Trp Pro Ile Tyr
145                 150                 155                 160

Gln Asn Asp Leu Ser Tyr Val Gly Gln Tyr Trp Asn Gln Thr Gly Phe
                165                 170                 175

Asp Leu Trp Glu Glu Val Gln Gly Ser Ser Phe Phe Thr Val Ala Val
            180                 185                 190

Gln His Lys Ala Leu Val Glu Gly Asp Ala Phe Ala Lys Ala Leu Gly
        195                 200                 205

Glu Glu Cys Gln Ala Cys Ser Val Ala Pro Gln Ile Leu Cys His Leu
    210                 215                 220

Gln Asp Phe Trp Asn Gly Ser Ala Val Leu Ser Asn Leu Pro Thr Asn
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225                 230                 235                 240

Gly Arg Ser Gly Leu Asp Thr Asn Ser Leu Leu Gly Ser Ile His Thr
                245                 250                 255

Phe Asp Pro Ala Ala Ala Cys Asp Asp Thr Thr Phe Gln Pro Cys Ser
            260                 265                 270

Ser Arg Ala Leu Ser Asn His Lys Leu Val Val Asp Ser Phe Arg Ser
        275                 280                 285

Val Tyr Gly Ile Asn Asn Gly Arg Gly Ala Gly Lys Ala Ala Ala Val
    290                 295                 300

Gly Pro Tyr Ala Glu Asp Thr Tyr Gln Gly Gly Asn Pro Trp Tyr Leu
305                 310                 315                 320

Thr Thr Leu Val Ala Ala Glu Leu Leu Tyr Asp Ala Leu Tyr Gln Trp
                325                 330                 335

Asp Lys Gln Gly Gln Val Asn Val Thr Glu Thr Ser Leu Pro Phe Phe
            340                 345                 350

Lys Asp Leu Ser Ser Asn Val Thr Thr Gly Ser Tyr Ala Lys Ser Ser
        355                 360                 365

Ser Ala Tyr Glu Ser Leu Thr Ser Ala Val Lys Thr Tyr Ala Asp Gly
    370                 375                 380

Phe Ile Ser Val Val Gln Glu Tyr Thr Pro Asp Gly Gly Ala Leu Ala
385                 390                 395                 400

Glu Gln Tyr Ser Arg Asp Gln Gly Thr Pro Val Ser Ala Ser Asp Leu
                405                 410                 415

Thr Trp Ser Tyr Ala Ala Phe Leu Ser Ala Val Gly Arg Arg Asn Gly
            420                 425                 430

Thr Val Pro Ala Ser Trp Gly Ser Ser Thr Ala Asn Ala Val Pro Ser
        435                 440                 445

Gln Cys
    450


<210> SEQ ID NO 8
<211> LENGTH: 441
<212> TYPE: PRT
<213> ORGANISM: Humicola grisea

<400> SEQUENCE: 8

Ala Ala Val Asp Thr Phe Ile Asn Thr Glu Lys Pro Ile Ala Trp Asn
1               5                   10                  15

Lys Leu Leu Ala Asn Ile Gly Pro Asn Gly Lys Ala Ala Pro Gly Ala
            20                  25                  30

Ala Ala Gly Val Val Ile Ala Ser Pro Ser Arg Thr Asp Pro Pro Tyr
        35                  40                  45

Phe Phe Thr Trp Thr Pro Asp Ala Ala Leu Val Leu Thr Gly Ile Ile
    50                  55                  60

Glu Ser Leu Gly His Asn Tyr Asn Thr Thr Leu Gln Gln Val Ser Asn
65                  70                  75                  80

Pro Ser Gly Thr Phe Ala Asp Gly Ser Gly Leu Gly Glu Ala Lys Phe
                85                  90                  95

Asn Val Asp Leu Thr Ala Phe Thr Gly Glu Trp Gly Arg Pro Gln Arg
            100                 105                 110

Asp Gly Pro Pro Leu Arg Ala Ile Ala Leu Ile Gln Tyr Ala Lys Trp
        115                 120                 125

Leu Ile Ala Asn Gly Tyr Lys Ser Thr Ala Lys Ser Val Val Trp Pro
    130                 135                 140
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Val Val Lys Asn Asp Leu Ala Tyr Thr Ala Gln Tyr Trp Asn Glu Thr
145                 150                 155                 160

Gly Phe Asp Leu Trp Glu Glu Val Pro Gly Ser Ser Phe Phe Thr Ile
                165                 170                 175

Ala Ser Ser His Arg Ala Leu Thr Glu Gly Ala Tyr Leu Ala Ala Gln
            180                 185                 190

Leu Asp Thr Glu Cys Pro Pro Cys Thr Thr Val Ala Pro Gln Val Leu
        195                 200                 205

Cys Phe Gln Gln Ala Phe Trp Asn Ser Lys Gly Asn Tyr Val Val Ser
    210                 215                 220

Thr Ser Thr Ala Gly Glu Tyr Arg Ser Gly Lys Asp Ala Asn Ser Ile
225                 230                 235                 240

Leu Ala Ser Ile His Asn Phe Asp Pro Glu Ala Gly Cys Asp Asn Leu
                245                 250                 255

Thr Phe Gln Pro Cys Ser Glu Arg Ala Leu Ala Asn His Lys Ala Tyr
            260                 265                 270

Val Asp Ser Phe Arg Asn Leu Tyr Ala Ile Asn Lys Gly Ile Ala Gln
        275                 280                 285

Gly Lys Ala Val Ala Val Gly Arg Tyr Ser Glu Asp Val Tyr Tyr Asn
    290                 295                 300

Gly Asn Pro Trp Tyr Leu Ala Asn Phe Ala Ala Ala Glu Gln Leu Tyr
305                 310                 315                 320

Asp Ala Ile Tyr Val Trp Asn Lys Gln Gly Ser Ile Thr Val Thr Ser
                325                 330                 335

Val Ser Leu Pro Phe Phe Arg Asp Leu Val Ser Ser Val Ser Thr Gly
            340                 345                 350

Thr Tyr Ser Lys Ser Ser Ser Thr Phe Thr Asn Ile Val Asn Ala Val
        355                 360                 365

Lys Ala Tyr Ala Asp Gly Phe Ile Glu Val Ala Ala Lys Tyr Thr Pro
    370                 375                 380

Ser Asn Gly Ala Leu Ala Glu Gln Tyr Asp Arg Asn Thr Gly Lys Pro
385                 390                 395                 400

Asp Ser Ala Ala Asp Leu Thr Trp Ser Tyr Ser Ala Phe Leu Ser Ala
                405                 410                 415

Ile Asp Arg Arg Ala Gly Leu Val Pro Pro Ser Trp Arg Ala Ser Val
            420                 425                 430

Ala Lys Ser Gln Leu Pro Ser Thr Cys
        435                 440


<210> SEQ ID NO 9
<211> LENGTH: 452
<212> TYPE: PRT
<213> ORGANISM: Hypocrea vinosa

<400> SEQUENCE: 9

Ser Val Asp Asp Phe Ile Asn Thr Gln Thr Pro Ile Ala Leu Asn Asn
1               5                   10                  15

Leu Leu Cys Asn Val Gly Pro Asp Gly Cys Arg Ala Phe Gly Thr Ser
            20                  25                  30

Ala Gly Ala Val Ile Ala Ser Pro Ser Thr Thr Asp Pro Asp Tyr Tyr
        35                  40                  45

Tyr Met Trp Thr Arg Asp Ser Ala Leu Val Phe Lys Asn Ile Val Asp
    50                  55                  60

Arg Phe Thr Gln Gln Tyr Asp Ala Gly Leu Gln Arg Arg Ile Glu Gln
65                  70                  75                  80
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Tyr Ile Ser Ala Gln Val Thr Leu Gln Gly Ile Ser Asn Pro Ser Gly
                85                  90                  95

Ser Leu Ser Asp Gly Ser Gly Leu Gly Glu Pro Lys Phe Glu Leu Thr
            100                 105                 110

Leu Ser Gln Phe Thr Gly Asn Trp Gly Arg Pro Gln Arg Asp Gly Pro
        115                 120                 125

Ala Leu Arg Ala Ile Ala Leu Ile Gly Tyr Ser Lys Trp Leu Ile Asn
    130                 135                 140

Asn Asn Tyr Gln Ser Thr Val Ser Asn Ile Ile Trp Pro Ile Val Arg
145                 150                 155                 160

Asn Asp Leu Asn Tyr Val Ala Gln Tyr Trp Asn Gln Thr Gly Phe Asp
                165                 170                 175

Leu Trp Glu Glu Val Asn Gly Ser Ser Phe Phe Thr Val Ala Asn Gln
            180                 185                 190

His Arg Ala Leu Val Glu Gly Ala Thr Leu Ala Ala Thr Leu Gly Gln
        195                 200                 205

Ser Gly Ser Thr Tyr Ser Ser Val Ala Pro Gln Ile Leu Cys Phe Leu
    210                 215                 220

Gln Arg Phe Trp Val Ser Gly Gly Tyr Ile Asp Ser Asn Ile Asn Thr
225                 230                 235                 240

Asn Glu Gly Arg Thr Gly Lys Asp Ala Asn Ser Leu Leu Ala Ser Ile
                245                 250                 255

His Thr Phe Asp Pro Ser Leu Gly Cys Asp Ala Ser Thr Phe Gln Pro
            260                 265                 270

Cys Ser Asp Lys Ala Leu Ser Asn Leu Lys Val Val Val Asp Ser Phe
        275                 280                 285

Arg Ser Ile Tyr Gly Val Asn Lys Gly Ile Pro Ala Gly Ser Ala Val
    290                 295                 300

Ala Ile Gly Arg Tyr Pro Glu Asp Val Tyr Phe Asn Gly Asn Pro Trp
305                 310                 315                 320

Tyr Leu Ala Thr Phe Ala Ala Ala Glu Gln Leu Tyr Asp Ser Val Tyr
                325                 330                 335

Val Trp Lys Lys Thr Gly Ser Ile Thr Val Thr Ser Thr Ser Ser Ala
            340                 345                 350

Phe Phe Gln Glu Leu Val Pro Gly Val Ala Ala Gly Thr Tyr Ser Ser
        355                 360                 365

Ser Gln Ser Thr Phe Thr Ser Ile Ile Asn Ala Ile Ser Thr Tyr Ala
    370                 375                 380

Asp Gly Phe Leu Ser Glu Ala Ala Lys Tyr Val Pro Ala Asp Gly Ser
385                 390                 395                 400

Leu Ala Glu Gln Phe Asp Arg Asn Thr Gly Thr Pro Leu Ser Ala Val
                405                 410                 415

His Leu Thr Trp Ser Tyr Ala Ser Phe Leu Thr Ala Ala Ala Arg Arg
            420                 425                 430

Ala Gly Val Val Pro Pro Ser Trp Ala Ser Ser Gly Ala Asn Thr Val
        435                 440                 445

Pro Ser Ser Cys
    450


<210> SEQ ID NO 10
<211> LENGTH: 25
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
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<223> OTHER INFORMATION: synthetic primer

<400> SEQUENCE: 10

tcgcgttaac gctagcatgg atctc 25

<210> SEQ ID NO 11
<211> LENGTH: 31
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (10)..(11)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 11

tctgttgacn nsttcatcag caccgagacg c 31

<210> SEQ ID NO 12
<211> LENGTH: 34
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (13)..(14)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 12

tctgttgacg acnnsatcag caccgagacg ccta 34

<210> SEQ ID NO 13
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 13

atcagcaccg agacgcctnn sgcactgaac aatcttcttt 40

<210> SEQ ID NO 14
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 14

ctttgcaatg ttggtcctnn sggatgccgt gcattcggca 40

<210> SEQ ID NO 15
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature

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<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 15

cctgatggat gccgtgcann sggcacatca gctggtgcgg 40

<210> SEQ ID NO 16
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 16

attgcatctc ccagcacann sgacccggac tactattaca 40

<210> SEQ ID NO 17
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 17

gcatctccca gcacaattnn sccggactac tattacatgt 40

<210> SEQ ID NO 18
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 18

tctcccagca caattgacnn sgactactat tacatgtgga 40

<210> SEQ ID NO 19
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 19

cccagcacaa ttgacccgnn stactattac atgtggacgc 40

<210> SEQ ID NO 20
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:

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<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 20

agcacaattg acccggacnn stattacatg tggacgcgag 40

<210> SEQ ID NO 21
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 21

attgacccgg actactatnn satgtggacg cgagatagcg 40

<210> SEQ ID NO 22
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 22

ccggactact attacatgnn sacgcgagat agcgctcttg 40

<210> SEQ ID NO 23
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 23

gaccgcttca ccgaaacgnn sgatgcgggc ctgcagcgcc 40

<210> SEQ ID NO 24
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 24

acgtacgatg cgggcctgnn scgccgcatc gagcagtaca 40

<210> SEQ ID NO 25
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer

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<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 25

tacgatgcgg gcctgcagnn scgcatcgag cagtacatta 40

<210> SEQ ID NO 26
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 26

ctccagggcc tctctaacnn stcgggctcc ctcgcggacg 40

<210> SEQ ID NO 27
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 27

ccctcgggct ccctcgcgnn sggctctggt ctcggcgagc 40

<210> SEQ ID NO 28
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 28

aagtttgagt tgaccctgnn sccttttcacc ggcaactggg 40

<210> SEQ ID NO 29
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 29

gagttgaccc tgaagcctnn saccggcaac tggggtcgac 40

<210> SEQ ID NO 30
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:

<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 30

ctgaagcctt tcaccggcnn stggggtcga ccgcagcggg 40

<210> SEQ ID NO 31
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 31

ttcaccggca actggggtnn sccgcagcgg gatggcccag 40

<210> SEQ ID NO 32
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 32

aactggggtc gaccgcagnn sgatggccca gctctgcgag 40

<210> SEQ ID NO 33
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 33

aagtggctca tcaacaacnn statcagtcg actgtgtcca 40

<210> SEQ ID NO 34
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 34

ctcatcaaca acaactatnn stcgactgtg tccaacgtca 40

<210> SEQ ID NO 35
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial

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<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 35

ctcaactatg ttgcccagnn stggaaccaa accggctttg 40

<210> SEQ ID NO 36
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 36

gttgcccagt actggaacnn saccggcttt gacctctggg 40

<210> SEQ ID NO 37
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 37

tactggaacc aaaccggcnn sgacctctgg gaagaagtca 40

<210> SEQ ID NO 38
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 38

caaaccggct ttgacctcnn sgaagaagtc aatgggagct 40

<210> SEQ ID NO 39
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 39

ggctttgacc tctgggaann sgtcaatggg agctcattct 40

<210> SEQ ID NO 40
<211> LENGTH: 40
<212> TYPE: DNA

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<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 40

tttgacctct gggaagaann saatgggagc tcattcttta 40

<210> SEQ ID NO 41
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 41

cttgctgcca ctcttggcnn stcgggaagc gcttattcat 40

<210> SEQ ID NO 42
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 42

actcttggcc agtcgggann sgcttattca tctgttgctc 40

<210> SEQ ID NO 43
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 43

tgctttctcc aacgattcnn sgtgtcgtct ggtggatacg 40

<210> SEQ ID NO 44
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 44

gactccaaca tcaacaccnn sgagggcagg actggcaagg 40

<210> SEQ ID NO 45
<211> LENGTH: 40

<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 45

tccaacatca acaccaacnn sggcaggact ggcaaggatg 40

<210> SEQ ID NO 46
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 46

atcaacacca acgagggcnn sactggcaag gatgtcaact 40

<210> SEQ ID NO 47
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 47

gtcgactcct tccgctccnn stacggcgtg aacaagggca 40

<210> SEQ ID NO 48
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 48

tccttccgct ccatctacnn sgtgaacaag ggcattcctg 40

<210> SEQ ID NO 49
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 49

tccatctacg gcgtgaacnn sggcattcct gccggtgctg 40

<210> SEQ ID NO 50

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<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 50

gctgccgtcg ccattggcnn statgcagag gatgtgtact 40

<210> SEQ ID NO 51
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 51

gccgtcgcca ttggccggnn sgcagaggat gtgtactaca 40

<210> SEQ ID NO 52
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 52

attggccggt atgcagagnn sgtgtactac aacggcaacc 40

<210> SEQ ID NO 53
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 53

ggccggtatg cagaggatnn stactacaac ggcaaccctt 40

<210> SEQ ID NO 54
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 54

cggtatgcag aggatgtgnn stacaacggc aacccttggt 40

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<210> SEQ ID NO 55
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 55

tatgcagagg atgtgtacnn saacggcaac ccttggtatc 40

<210> SEQ ID NO 56
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 56

gcagaggatg tgtactacnn sggcaaccct tggtatcttg 40

<210> SEQ ID NO 57
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 57

tactacaacg gcaaccctnn statcttgct acatttgctg 40

<210> SEQ ID NO 58
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 58

gatgccatct acgtctggnn saagacgggc tccatcacgg 40

<210> SEQ ID NO 59
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 59

gccatctacg tctggaagnn sacgggctcc atcacggtga 40

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<210> SEQ ID NO 60
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 60

tccatcacgg tgaccgccnn stccctggcc ttcttccagg 40

<210> SEQ ID NO 61
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 61

acctccctgg ccttcttcnn sgagcttgtt cctggcgtga 40

<210> SEQ ID NO 62
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 62

gagcttgttc ctggcgtgnn sgccgggacc tactccagca 40

<210> SEQ ID NO 63
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 63

gtgacggccg ggacctacnn sagcagctct tcgaccttta 40

<210> SEQ ID NO 64
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 64

acggccggga cctactccnn sagctcttcg acctttacca 40

<210> SEQ ID NO 65
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 65

agctcttcga cctttaccnn satcatcaac gccgtctcga 40

<210> SEQ ID NO 66
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 66

ctcagcgagg ctgccaagnn sgtccccgcc gacggttcgc 40

<210> SEQ ID NO 67
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 67

gctgccaagt acgtccccnn sgacggttcg ctggccgagc 40

<210> SEQ ID NO 68
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 68

tacgtccccg ccgacggtnn sctggccgag cagtttgacc 40

<210> SEQ ID NO 69
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 69

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ctggccgagc agtttgacnn saacagcggc actccgctgt 40

<210> SEQ ID NO 70
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 70

gccgagcagt ttgaccgcnn sagcggcact ccgctgtctg 40

<210> SEQ ID NO 71
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 71

tttgaccgca acagcggcnn sccgctgtct gcgcttcacc 40

<210> SEQ ID NO 72
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 72

actccgctgt ctgcgcttnn sctgacgtgg tcgtacgcct 40

<210> SEQ ID NO 73
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 73

tctgcgcttc acctgacgnn stcgtacgcc tcgttcttga 40

<210> SEQ ID NO 74
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 74

ttgacagcca cggcccgtnn sgctggcatc gtgccccccc 40

<210> SEQ ID NO 75
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 75

acggcccgtc gggctggcnn sgtgcccccc tcgtgggcca 40

<210> SEQ ID NO 76
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (19)..(20)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 76

agcgctagca cgatccccnn sacgtgctcc ggcgcgtccg 40

<210> SEQ ID NO 77
<211> LENGTH: 24
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer

<400> SEQUENCE: 77

gtaacatcag agattttgag acac 24

<210> SEQ ID NO 78
<211> LENGTH: 31
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 78

gcgtctcggt gctgatgaas nngtcaacag a 31

<210> SEQ ID NO 79
<211> LENGTH: 34
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 79

taggcgtctc ggtgctgats nngtcgtcaa caga 34

<210> SEQ ID NO 80
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 80

aaagaagatt gttcagtgcs nnaggcgtct cggtgctgat 40

<210> SEQ ID NO 81
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 81

tgccgaatgc acggcatccs nnaggaccaa cattgcaaag 40

<210> SEQ ID NO 82
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 82

ccgcaccagc tgatgtgccs nntgcacggc atccatcagg 40

<210> SEQ ID NO 83
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 83

tgtaatagta gtccgggtcs nntgtgctgg gagatgcaat 40

<210> SEQ ID NO 84
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 84

acatgtaata gtagtccggs nnaattgtgc tgggagatgc 40

<210> SEQ ID NO 85
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 85

tccacatgta atagtagtcs nngtcaattg tgctgggaga 40

<210> SEQ ID NO 86
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 86

gcgtccacat gtaatagtas nncgggtcaa ttgtgctggg 40

<210> SEQ ID NO 87
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 87

ctcgcgtcca catgtaatas nngtccgggt caattgtgct 40

<210> SEQ ID NO 88
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 88

cgctatctcg cgtccacats nnatagtagt ccgggtcaat 40

<210> SEQ ID NO 89
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 89

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caagagcgct atctcgcgts nncatgtaat agtagtccgg 40

<210> SEQ ID NO 90
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 90

ggcgctgcag gcccgcatcs nncgtttcgg tgaagcggtc 40

<210> SEQ ID NO 91
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 91

tgtactgctc gatgcggcgs nncaggcccg catcgtacgt 40

<210> SEQ ID NO 92
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 92

taatgtactg ctcgatgcgs nnctgcaggc ccgcatcgta 40

<210> SEQ ID NO 93
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 93

cgtccgcgag ggagcccgas nngttagaga ggccctggag 40

<210> SEQ ID NO 94
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 94

gctcgccgag accagagccs nncgcgaggg agcccgaggg 40

<210> SEQ ID NO 95
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 95

cccagttgcc ggtgaaaggs nncagggtca actcaaactt 40

<210> SEQ ID NO 96
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 96

gtcgacccca gttgccggts nnaggcttca gggtcaactc 40

<210> SEQ ID NO 97
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 97

cccgctgcgg tcgaccccas nngccggtga aaggcttcag 40

<210> SEQ ID NO 98
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 98

ctgggccatc ccgctgcggs nnaccccagt tgccggtgaa 40

<210> SEQ ID NO 99
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

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<400> SEQUENCE: 99

ctcgcagagc tgggccatcs nnctgcggtc gaccccagtt 40

<210> SEQ ID NO 100
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 100

tggacacagt cgactgatas nngttgttga tgagccactt 40

<210> SEQ ID NO 101
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 101

tgacgttgga cacagtcgas nnatagttgt tgttgatgag 40

<210> SEQ ID NO 102
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 102

caaagccggt ttggttccas nnctgggcaa catagttgag 40

<210> SEQ ID NO 103
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 103

cccagaggtc aaagccggts nngttccagt actgggcaac 40

<210> SEQ ID NO 104
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

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<400> SEQUENCE: 104

tgacttcttc ccagaggtcs nngccggttt ggttccagta 40

<210> SEQ ID NO 105
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 105

agctcccatt gacttcttcs nngaggtcaa agccggtttg 40

<210> SEQ ID NO 106
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 106

agaatgagct cccattgacs nnttcccaga ggtcaaagcc 40

<210> SEQ ID NO 107
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 107

taaagaatga gctcccatts nnttcttccc agaggtcaaa 40

<210> SEQ ID NO 108
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 108

atgaataagc gcttcccgas nngccaagag tggcagcaag 40

<210> SEQ ID NO 109
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)

<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 109

gagcaacaga tgaataagcs nntcccgact ggccaagagt 40

<210> SEQ ID NO 110
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 110

cgtatccacc agacgacacs nngaatcgtt ggagaaagca 40

<210> SEQ ID NO 111
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 111

ccttgccagt cctgccctcs nnggtgttga tgttggagtc 40

<210> SEQ ID NO 112
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 112

catccttgcc agtcctgccs nngttggtgt tgatgttgga 40

<210> SEQ ID NO 113
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 113

agttgacatc cttgccagts nngccctcgt tggtgttgat 40

<210> SEQ ID NO 114
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature

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<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 114

tgcccttgtt cacgccgtas nnggagcgga aggagtcgac 40

<210> SEQ ID NO 115
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 115

caggaatgcc cttgttcacs nngtagatgg agcggaagga 40

<210> SEQ ID NO 116
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 116

cagcaccggc aggaatgccs nngttcacgc cgtagatgga 40

<210> SEQ ID NO 117
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 117

agtacacatc ctctgcatas nngccaatgg cgacggcagc 40

<210> SEQ ID NO 118
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 118

tgtagtacac atcctctgcs nnccggccaa tggcgacggc 40

<210> SEQ ID NO 119
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer

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<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 119

ggttgccgtt gtagtacacs nnctctgcat accggccaat 40

<210> SEQ ID NO 120
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 120

aagggttgcc gttgtagtas nnatcctctg cataccggcc 40

<210> SEQ ID NO 121
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 121

accaagggtt gccgttgtas nncacatcct ctgcataccg 40

<210> SEQ ID NO 122
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 122

gataccaagg gttgccgtts nngtacacat cctctgcata 40

<210> SEQ ID NO 123
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 123

caagatacca agggttgccs nngtagtaca catcctctgc 40

<210> SEQ ID NO 124
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial

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<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 124

cagcaaatgt agcaagatas nnagggttgc cgttgtagta 40

<210> SEQ ID NO 125
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 125

ccgtgatgga gcccgtctts nnccagacgt agatggcatc 40

<210> SEQ ID NO 126
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 126

tcaccgtgat ggagcccgts nncttccaga cgtagatggc 40

<210> SEQ ID NO 127
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 127

cctggaagaa ggccagggas nnggcggtca ccgtgatgga 40

<210> SEQ ID NO 128
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 128

tcacgccagg aacaagctcs nngaagaagg ccagggaggt 40

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<210> SEQ ID NO 129
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 129

tgctggagta ggtcccggcs nncacgccag gaacaagctc 40

<210> SEQ ID NO 130
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 130

taaaggtcga agagctgcts nngtaggtcc cggccgtcac 40

<210> SEQ ID NO 131
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 131

tggtaaaggt cgaagagcts nnggagtagg tcccggccgt 40

<210> SEQ ID NO 132
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 132

tcgagacggc gttgatgats nnggtaaagg tcgaagagct 40

<210> SEQ ID NO 133
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 133

gcgaaccgtc ggcggggacs nncttggcag cctcgctgag 40

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<210> SEQ ID NO 134
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 134

gctcggccag cgaaccgtcs nnggggacgt acttggcagc 40

<210> SEQ ID NO 135
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 135

ggtcaaactg ctcggccags nnaccgtcgg cggggacgta 40

<210> SEQ ID NO 136
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 136

acagcggagt gccgctgtts nngtcaaact gctcggccag 40

<210> SEQ ID NO 137
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 137

cagacagcgg agtgccgcts nngcggtcaa actgctcggc 40

<210> SEQ ID NO 138
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 138

ggtgaagcgc agacagcggs nngccgctgt tgcggtcaaa 40

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<210> SEQ ID NO 139
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 139

aggcgtacga ccacgtcags nnaagcgcag acagcggagt 40

<210> SEQ ID NO 140
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 140

tcaagaacga ggcgtacgas nncgtcaggt gaagcgcaga 40

<210> SEQ ID NO 141
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 141

agggggcac gatgccagcs nnacgggccg tggctgtcaa 40

<210> SEQ ID NO 142
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 142

tggcccacga ggggggcacs nngccagccc gacgggccgt 40

<210> SEQ ID NO 143
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer
<220> FEATURE:
<221> NAME/KEY: misc_feature
<222> LOCATION: (21)..(22)
<223> OTHER INFORMATION: n is a, c, g, or t

<400> SEQUENCE: 143

cggacgcgcc ggagcacgts nnggggatcg tgctagcgct 40

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<210> SEQ ID NO 144
<211> LENGTH: 33
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer

<400> SEQUENCE: 144

gcatctccca gcacacgaga cccggactac tat 33

<210> SEQ ID NO 145
<211> LENGTH: 33
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer

<400> SEQUENCE: 145

gcatctccca gcacatacga cccggactac tat 33

<210> SEQ ID NO 146
<211> LENGTH: 33
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer

<400> SEQUENCE: 146

gatgcgggcc tgcagctgcg catcgagcag tac 33

<210> SEQ ID NO 147
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer

<400> SEQUENCE: 147

ctgaagcctt tcaccggcac ctggggtcga ccgcagcggg 40

<210> SEQ ID NO 148
<211> LENGTH: 39
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer

<400> SEQUENCE: 148

tgaagccttt caccggctac tggggtcgac cgcagcggg 39

<210> SEQ ID NO 149
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer

<400> SEQUENCE: 149

ctgaagcctt tcaccggcga ctggggtcga ccgcagcggg 40

<210> SEQ ID NO 150
<211> LENGTH: 36
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer

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<400> SEQUENCE: 150

agtggctcat caacaacgas tatcagtcga ctgtgt 36

<210> SEQ ID NO 151
<211> LENGTH: 36
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer

<400> SEQUENCE: 151

agtggctcat caacaacacc tatcagtcga ctgtgt 36

<210> SEQ ID NO 152
<211> LENGTH: 34
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer

<400> SEQUENCE: 152

gtggctcatc aacaatggta tcagtcgact gtgt 34

<210> SEQ ID NO 153
<211> LENGTH: 36
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer

<400> SEQUENCE: 153

agtggctcat caacaacctg tatcagtcga ctgtgt 36

<210> SEQ ID NO 154
<211> LENGTH: 36
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer

<400> SEQUENCE: 154

agtggctcat caacaactcc tatcagtcga ctgtgt 36

<210> SEQ ID NO 155
<211> LENGTH: 38
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer

<400> SEQUENCE: 155

ttgcccagta ctggaacgas accggctttg acctctgg 38

<210> SEQ ID NO 156
<211> LENGTH: 38
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer

<400> SEQUENCE: 156

ttgcccagta ctggaacstg accggctttg acctctgg 38

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<210> SEQ ID NO 157
<211> LENGTH: 38
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer

<400> SEQUENCE: 157

ttgcccagta ctggaacacc accggctttg acctctgg 38

<210> SEQ ID NO 158
<211> LENGTH: 38
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer

<400> SEQUENCE: 158

ttgcccagta ctggaaccga accggctttg acctctgg 38

<210> SEQ ID NO 159
<211> LENGTH: 38
<212> TYPE: DNA
<213> ORGANISM: Artificial
<220> FEATURE:
<223> OTHER INFORMATION: synthetic primer

<400> SEQUENCE: 159

ttgcccagta ctggaactgc accggctttg acctctgg 38

<210> SEQ ID NO 160
<211> LENGTH: 6
<212> TYPE: PRT
<213> ORGANISM: Trichoderma reesei

<400> SEQUENCE: 160

Ser Val Asp Asp Phe Ile
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What is claimed is:

1. An isolated glucoamylase variant comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 2, wherein said variant includes a substitution at position Y315 compared to the amino acid sequence of SEQ ID NO: 2.

2. The isolated glucoamylase variant of claim **1**, wherein said variant includes the substitution Y315F compared to the amino acid sequence of SEQ ID NO: 2.

3. The isolated glucoamylase variant of claim **1**, wherein the variant further comprises a substitution in a position selected from: D4L/E/R/S/C/A/Q/W, F5C/M/N/R/S/T/V/W, D24E/L/Y/T, F29L/I/D/C/S/V/W, I43R/F/D/Y/S, D44E/H/K/S/N/Y/F/R, Y47W, Y49N, Q70R/K/M/P/G/L/F, Q75R/K/A, R76L/M/K/T/P, P94L, D100W/I/Q/M/P/A/N, N119P/T/Y/D/E, N146S/G/C/H/E/D/T/W/L/M, Q148V/Y/H/A/C/D/G/M/R/S/T, Y169D/F, Q172C/A/D/R/E/F/H/V/L/M/N/S/T/V, E180A/C/G/H/I/L/N/P/Q/R/S/T/V/Y, V181E/C/D/G/H/I/P/T/Y/S/K/F/A, S211C/R/E/A/Y/W/M/H/L/I/R/Q/T, E243S/R/N/M/Y/A/L, R245A/E/M/I/P/V, I292D/H/P/R/T/N/V/F/L, G294D/E/T/Q/I/A, K297F/L/P/T/M/D/N/Q/A/Y/H/S/R/W, R309A/C/G/H/I/N/P/Q/S/T/W/Y/L, Y310E/G/L/P/S/W/R/Q, D313Q, V314A/R/N/D/C/E/Q/G/H/I/K/L/M/F/P/S/T/W/Y, Y316Q/R, N317T/H, K340D/T, K341F/D/P/V/G/S, T350S/E/A/N, Q356H/D/E, T363L/R/C/H/W, S368W/D/F/L, S369F, N376Q/T/H/S/V, Y395Q/R/S, A398S/I/T, S401C/V, R408S, N409W/T/K, T412A/h/K/G, R433H/Q, I436A/T and S451M/T/H compared to the amino acid sequence of SEQ ID NO: 2.

4. The isolated glucoamylase variant of claim **1**, wherein said variant exhibits increased thermostability as compared to the glucoamylase of SEQ ID NO: 2.

5. The isolated glucoamylase variant of claim **1**, wherein said variant exhibits increased specific activity compared to the glucoamylase of SEQ ID NO: 2.

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